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OFFSET PRINTING MACHINE OPERATOR

Learner Guide

National Vocational Certificate Level 2

Version 1 - September 2018

NAVTTC

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Introduction:

This Learner's Guide is developed on the basis of competency standards and curriculum of "Assistant Offset Printing Machine Operator".

The National Vocational & Technical Training Commission (NAVTTC) has developed a national qualification entitled, "National Vocational Certificate Level-2 in Printing & Packaging Technology (Assistant Offset Printing Machine Operator)". Relevant industry and employers were consulted in the design and validation processes in order to come up with a national qualification that fulfills the requirements of the sector in general and the occupation in particular.

This book covers all the topics in a clear and organized format for the Printing Technology students. Through learning outcomes practical activities were added step by steps. The topics covered were neatly illustrated for better understanding of the learners. All of the lesson pages were carefully designed to eliminate distraction and to focus the pupil's full attention on the work at hand.

It carries 7 learning modules which are as under:

Module A: Perform pre-run maintenance
Module B: Interpret printing instructions on docket
Module C: Make ready print
Module D: Perform print run
Module E: Perform post production activities
Module F: Complete Documentation Requirements
Module G: Adhere to Safety Standards and Regulations

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Module-A

Module A: - Perform Pre-run Maintenance

Learning Outcomes:

After completion of this module the learner will be able to:

- Perform daily cleaning of printing surrounding as per press room SOPs
- Perform cleaning of the machine as per OEM manual
- Perform cleaning of associated tools as per press room SOPs
- Perform periodic cleaning as per duty chart
- Compare quality of oil in machine with quality recommended in machine manual
- Maintain oil level as per machine specifications.
- Perform inching procedure on printing machine as per SOPs
- Verify inching through test print
- Verify humidity of press room as per press room SOPs
- Apply humidity management techniques in press room.

Learning Unit 1-1:

Perform Cleaning in Press Room

Overview:

This learning unit describes the history of printing. It also describes importance and methods of press room cleaning with cleaning equipment and consumable.

Printing:

Printing means reproducing words or images on paper, card, plastic, fabric, or another material. The word "printing" ultimately comes a Latin word, "*premĕre"*, which means to press; just about every type of printing involves pressing one thing against another.

History:

1500: The first lithographic (printing with stone) printing was invented by Johannes Gutenberg in Germany.

1875: The first rotary offset lithographic printing press was created in England and patented in 1875 by Robert Barclay. It used a cardboard covered cylinder to transfer the image from stone to a metal surface.

Do you know?

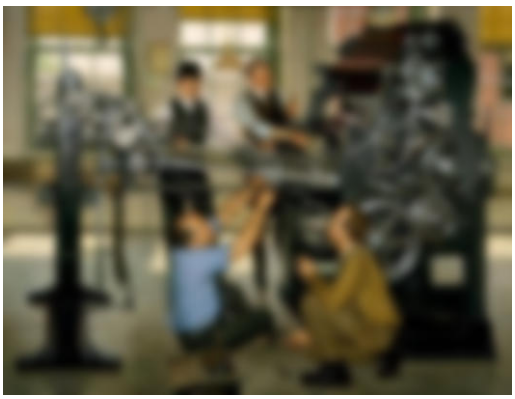
Lithography means writing with stones and is based on the principle that "water and oil do not mix".

1880: Rubber is discovered as a more effective transfer method on an offset printing cylinder.

1892: First four color rotary press is invented.

1895: Harris Automatic Press Company is founded in Nile, Ohio. The company begins research on how to better the offset printing process.

1903: Ira Washington Rubel of the United States, first uses the offset process and uses it to print on paper. He discovers that images print sharper by printing from the stone to the blanket and then to the paper. This forms the basis for all modern offset lithography.



1911: Roland enters the offset printing market with their first offset printing press.

1930: Heatest printing makes a debut with the first heatest inks being produced for offset printers.

1950: Lithographic offset printing becomes a direct competitor with letter press.

1960: More and more newspaper printers begin replacing their outdated letterpress machines with offset presses.

1962: Heidelberg begins development of offset printing presses.

1995: Computer-to-plate (CTP) makes its debut at trade shows around the world.
1998: Heidelberg patents the gapless printing cylinder.

2002: Man Roland patents the magnetic brake system for folders allowing quarter folders to print faster.

Types of Printing:

There are several types of printing.

- Letterpress Printing
- Offset Printing
- Flexography
- Rotogravure
- Screen Printing
- Digital Printing

Letterpress Printing:

Letterpress printing is a term for printing text with movable type, in which the raised surface of the type is inked and then pressed against a smooth substance to obtain an image in reverse.

Offset Printing:

Offset printing is a widely used printing technique where the inked image is transferred from a plate to a rubber blanket, then to the printing surface. Initially it was called lithography means “Printing with stone”.

Remember:

Offset printing means, the image first “Off” than “Set” on any substrate.

Types of Offset Press:

There are two main kinds of offset presses.

Sheet fed offset press: In a sheet fed press the substrate is fed to the press in single sheets and each sheet is printed individually. The printed substrate is then collected in a tray and stacked neatly.

Typical standard sheet-fed sizes:

12" x 18": (small press ideally used for printing of letterhead, business cards, flyers, envelopes, and forms)

14” x 20”

19" x 26"

20" x 29"

25" x 36"

28” X 40”

Web fed offset press: In a web fed press the substrate is fed to the press from a continuous roll (reel). After printing, the roll is either rewind onto a coil or cut into sheets depending on the requirements.

Flexography:

Flexography, often abbreviated to flexo, is a method of printing most commonly used for soft (flexible) packaging. A flexo print is achieved by creating a mirrored master of the required image as a 3D relief in a rubber or polymer material.

Rotogravure Printing:

Rotogravure is a type of intaglio printing process, in that it involves engraving the image onto an image carrier (cylinder). In gravure printing, the image is engraved onto a copper cylinder because, like web offset and flexo printing, it use on rotary printing system.

Screen Printing:

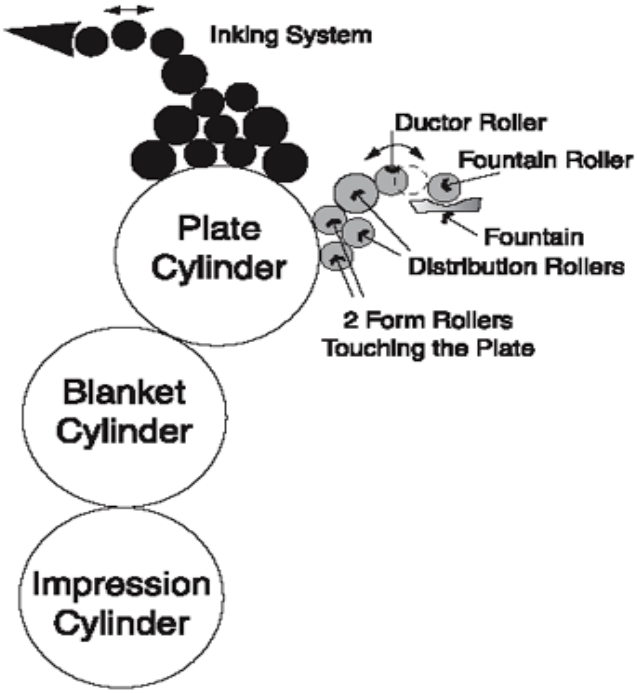
Screen printing is a **printing** technique whereby a mesh is used to transfer ink onto a substrate, except in areas made impermeable to the ink by a blocking stencil.

Digital Printing:

Digital printing is the process of printing digital-based images directly onto a variety of media substrates such as common or photographic paper, film, cloth, and plastics. There is no need for a printing plate, unlike with offset printing.

Main Parts of Offset printing Machine:

There are 5 main components of an offset printing machine.



A typical offset press is made of a;

Feeder to supply substrate to the feeding system

A set of Cylinders to create the printed image

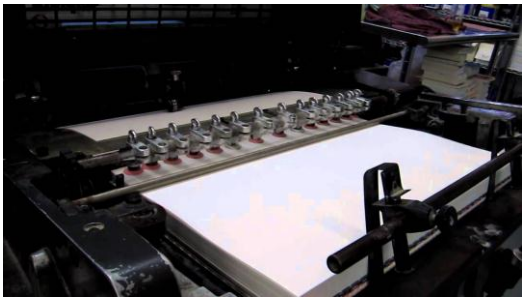
A roller train to ink the image areas of the plate and dampening the non- image areas of the plate

Dampening system to supply water (fountain solution) to the plate

Delivery system to collect the printed substrate after printing

1. **Feeding System:** The feeding system refers to the mechanism that feeds paper or any other substrate into the printing unit. In sheet fed press the substrate is

stacked together in a tray. Vacuum devices (called suckers) pick up each sheet of paper from the stack and feed it into the printing unit one at a time.

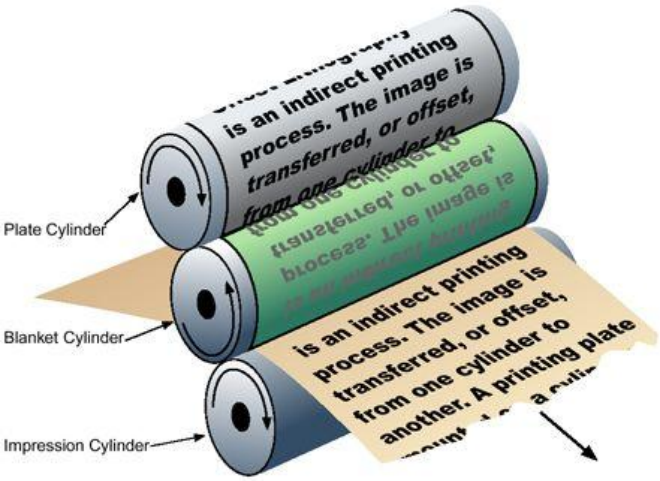


2. **Printing System or Cylinder:** Offset presses generally use three cylinders.

   Plate cylinder

   Blanket cylinder

   Impression cylinder

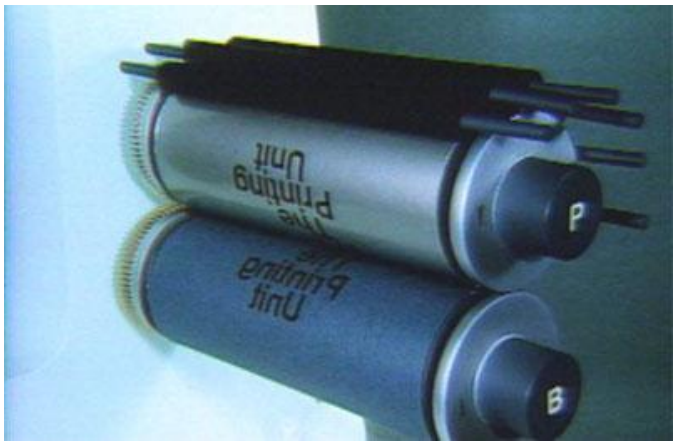


The top cylinder on single/multi-color sheet fed offset presses is the plate cylinder. The aluminum plate is mounted on the plate cylinder on which the image is drawn right side up. This image is transferred onto the blanket cylinder in reverse (first “off” then “set”).

The functions of the plate cylinder are:

- To mount the plate tightly on the plate cylinder;
- To carry the plate in contact with the dampening rollers that wet the non image area

- To maintain the contact of plate and inking rollers that ink the image area;
- To transfer the inked image to the blanket cylinder.



Under the plate cylinder is the blanket cylinder. The blanket cylinder then passes the image onto the impression cylinder-once again right side up on substrate. The blanket cylinder also has bearers, bearings, and drive gears.

The functions of the blanket cylinder are:

- To carry the blanket cylinder in contact with the inked image from the plate cylinder,
- To transfer the ink film image to the substrate carried by the impression cylinder.

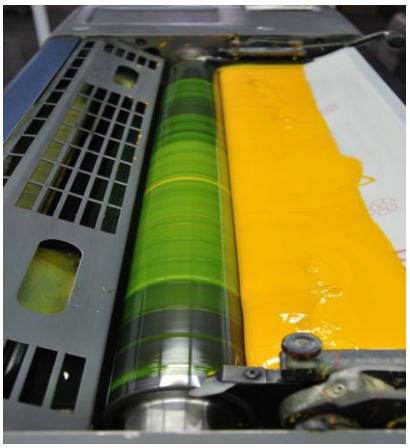
The impression cylinder, the third cylinder of the printing unit, is usually located behind the blanket cylinder.

The functions of the impression (Counter) cylinder are:

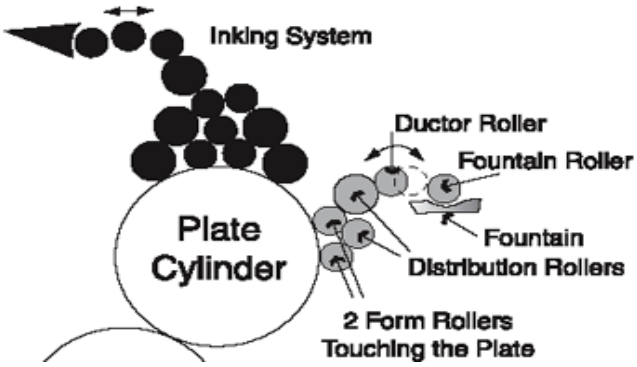
- It carries the substrate from the feeding unit and helps to transfer the image on substrate from blanket cylinder, then transfers the substrate to the delivery unit.

3. **Inking System:** It is made up of an ink fountain (duct), which holds the ink and a set of rollers known as the roller train.

A roller draws ink from the ink fountain into the roller train. The ink is milled to the required thickness and brought to the final rollers in the roller train known as the form rollers. They transfer ink to the plate.



4. **Dampening System:** The dampening system is consist a set of dampening rollers. These apply the fountain solution to the plate to keep the non-image areas from getting inked.



5. **Delivery System:** This is the mechanism that collects the printed substrate from the printing unit and stack it in a neat manner.

In sheet fed presses the printed sheets of substrate are carried from the printing unit into a delivery tray where they are neatly stacked.

Importance of Tidiness in Press Room:

Cleaning and tidiness can help control or eliminate workplace hazards. Poor housekeeping practices frequently contribute to incidents.

Effective cleaning is an ongoing operation: it is not a one-time or hit-and-miss cleanup done occasionally. Periodic "panic" cleanups are costly and ineffective in reducing incidents.

Method of Cleaning in Press:

The work environment influences employee's productivity, performance, and well-being. Keeping your facility clean and safe is critical and choosing the correct cleaning equipment will help. A good housekeeping program plans and manages the orderly storage and movement of materials from point of entry to exit. It includes a material flow plan to ensure minimal handling. The plan also makes sure that work areas are not used as storage areas by having workers move materials to and from work areas as needed.

An assistant machine operator must check the following before start the job printing:

- Power on the machine
- Ensure that tools are not idle on machine
- Oil and grease the machine properly
- Clean the machine with cotton rags
- Make sure to fix the wet dampening rollers on the proper place
- Check the water level in the water tank
- Make sure to clean the surroundings of machine as well.
- Cleaning and organization must be done regularly, not just at the end of the shift

Cleaning order should be "maintained" not "achieved."

A good housekeeping program identifies and assigns responsibilities for the following:

- clean up during the shift
- day-to-day cleanup
- waste disposal
- removal of unused materials
- inspection to ensure cleanup is complete

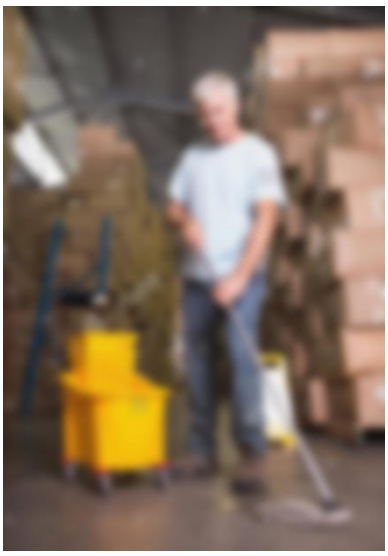
Workplace Cleaning Equipment:

Here is some cleaning equipment for workplace cleanliness

1. **Trash containers:** One of the simplest ways to control odors and contain waste is with the correct size and style trash container. Oftentimes, trash containers and receptacles are incorrectly sized for the area. Too large, and the container or receptacle may not get changed as needed causing odors and bacteria to press. Too small, and the trash may over-fill prematurely. The wrong size liner will contribute to increased and unnecessary costs due to excessive plastic waste.

2. **Transportation:** Cleaning supplies and equipment must be “at the ready” when needed. Utility, tilt, cube, and janitor style carts are a great addition to help transport supplies and equipment from place to place and haul trash out of the building.

3. **Mopping Systems:** Hard floors should be dust mopped or swept daily to remove loose, dry garbage that can abrade the floor surface.



Following are the some other workplace cleaning material

a) Brush

b) Cleaning rags \ cloth

Machine cleaning consumables:

Following are the workplace cleaning consumable

i. Plate cleaner

ii. Roller cleaner

iii. Cylinder Cleaner

iv. IPA

v. Cleaning Sponge

vi. Kerosene Oil

Practical Activity:

Module: A	**Perform Pre-run Maintenance**	
	Learning Unit: 1-1	**Perform Cleaning in Press Room**
	Practical Description:	Perform daily cleaning of printing surrounding as per press SOP
Time:	5 hours	
Equipment	Offset printing machine	
Tools	N/A	
PPE	Proper dress, safety shoes, safety gloves	
Materials	Cleaning Cloth, Cleaning brush, Dust bin	
Key Point	A clean workplace ensures the safety and health of employees and visitors.	
Learning Outcome:	Perform daily cleaning of printing surrounding as per press SOPs	
Precautions:	Ensure to wear safety shoes and other safety equipment before starting this process	

Instructions	**Illustrations**
1. Inspect entire surrounding areas of printing machine thoroughly	
2. Clean floor of surrounding areas of the machine with brush	

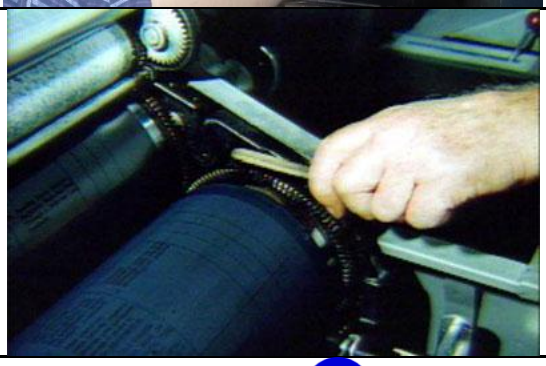
3. Use cloth to clean oil leakage	
4. Re-inspect the whole surrounding area and make sure that it has been cleaned properly	
5. Dispose of used article and place the brush at its respective place	
6. Wash your hands properly with soap/detergent	

Practical Activity:

Module: A	**Perform Pre-run Maintenance**

	Learning Unit: 1-1	**Perform Cleaning in Press Room**
	Practical Description:	Perform cleaning of the machine as per OEM manual
Time:	5 hours	
Equipment	Offset printing machine	
Tools	Ink scrapper, Cleaning Brush	
PPE	Proper dress code, Safety gloves, safety shoes	
Materials	Plate cleaner, Roller cleaner, IPA, Sponge, Kerosene oil, Cleaning rags/cloth, Dust bin	
Key Point	Avoid use of kerosene oil on rollers, plate cylinder and impression cylinder	
Learning Outcome:	Perform cleaning of the machine as per OEM manual	
Precautions:	Ensure to wear safety shoes and other safety equipment before starting this process	

Instructions	**Illustrations**
1. Take clean cloth/cotton rags	
2. Put cleaning agent on the cloth	

3. Clean the machine gently with wet cloth	
4. Inspect machine and make sure that no space or part remain unclean.	
5. Dispose of the used cloth in a dust bin	
6. Wash your hands properly with soap/detergent	

Practical Activity:

Module: A	**Perform Pre-run Maintenance**	
	Learning Unit: 1-1	**Perform Cleaning in Press Room**
	Practical Description:	Perform cleaning of associated tools as per press room SOPs
Time:	5 hours	
Equipment	Offset printing machine	
Tools	Cleaning Brush	
PPE	Proper dress code, Safety gloves, Safety shoes	
Materials	Cloth, Cleaning agent	
Key Point	If you take care of and store the tools properly, they will last a lifetime.	
Learning Outcome:	Perform cleaning of associated tools as per press room SOPs	
Precautions:	Ensure to wear safety shoes and other safety equipment before starting this process	

Instructions	**Illustrations**
1. Arrange all used tools in order	
2. Pick tools one by one, and clean it with cloth and cleaning solvent thoroughly.	

3. Place clean tools to its respective place	
4. Dispose of used articles in dustbin.	
5. Place unused cloth and solvent agents to their respective places	
6. Wash your hands properly with soap/detergent	

Practical Activity:

Module: A	**Perform Pre-run Maintenance**	
	Learning Unit: 1-1	**Perform Cleaning in Press Room**
	Practical Description:	Perform periodic cleaning as per duty chart
Time:	5 hours	
Equipment	Offset printing machine	
Tools	N/A	
PPE	Safety gloves, safety shoes	
Materials	Cloth, Cleaning agent, Cleaning brush	
Key Point	A clean workplace ensures the safety and health of employees and visitors.	
Learning Outcome:	Perform periodic cleaning as per duty chart	
Precautions:	Ensure to wear safety shoes and other safety equipment before starting this process	

Instructions	**Illustrations**
1. Inspect entire surrounding areas of machine thoroughly	
2. Clean floor of surrounding areas of the machine with brush	

3. use cloth to clean oil leakage	
4. Re-inspect the whole surrounding area and make sure that it has been cleaned properly	
5. Dispose of used article and place the brush at its respective place	
6. Take clean cloth\ cotton rags.	

7. Clean the machine gently with wet cloth	
8. Inspect machine and make sure that no space or part remain unclean	
9. Dispose of the used cloth in a dustbin	
10. Arrange all used tools in order	

11. Pick tools one by one, and clean it with cloth and cleaning solvent thoroughly.	
12. Place clean tools to its respective place.	
13. Dispose of used articles in dustbin	
14. Place unused cloth and solvent agents to their respective places	
15. Wash your hands properly with soap/detergent	

Learning Unit 1-2:

Maintain Oil Level

Overview:

In this learning unit learner will be able to know about oil viscosity, quality, level and grading.

Do you know?

Viscosity is the measure of a fluid's resistance to flow

Viscosity: is a measure of a fluid's resistance to flow. It describes the internal frictio of a moving fluid. It is checking the lubrication particles in oil.

Disadvantages of using low quality oil in machine:

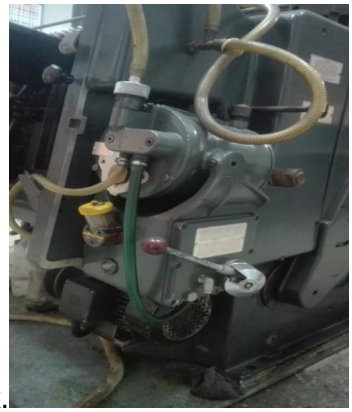
1. It can damage machine gears
2. It will produce unpleasant sound
3. It will damage other parts of machine
4. It will cause low performance of machine

Capacity of oil tank in printing machine:

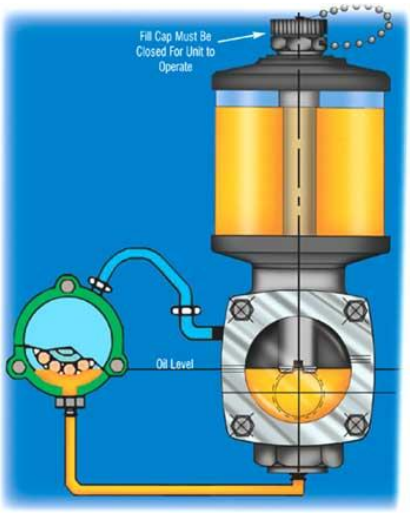
Every machine has different size of oil tanks according to its speed and size.

Remember:

Usage of Kerosene oil is prohibited in printing machine. It harms plate, roller, blanket and dampening system.



It should be in between min and max level mark.



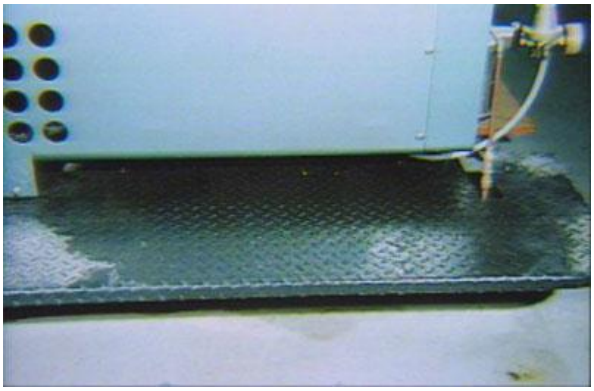
Machine has automatic pumping system to pick the oil and supply to particular parts according to their requirements.

Oil grading system in printing machine

The selection of oil must be according to machine manual

List reasons of maintain oil level in machine:

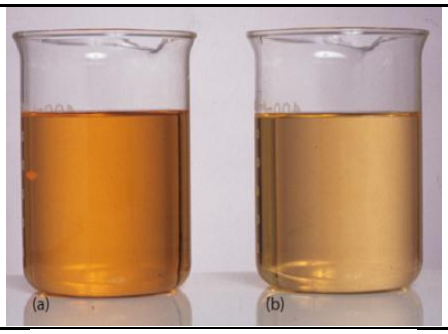
- Non-maintained oil level may cause gear accidents.
- Low oil level may cause low performance of machine.
- Excess oil should be wiped from the press to prevent it from running on the floor causing a hazardous working area around the press



Practical Activity:

Module: A	**Perform pre-run maintenance**	
	Learning Unit: 1-2	**Maintain oil level**
	Practical Description:	**Compare quality of oil in machine with quality recommended in machine manual:**
Time:	7 hours	
Equipment	Offset printing machine	
Tools	Funnel, Spanner set, Allen Key set	
PPE	Proper dress, Safety shoes, safety gloves	
Materials	Standard oil, substandard oil, OEM manual	
Key Point	Always use good quality oil	
Learning Outcome:	Compare quality of oil in machine with quality recommended in machine manual	

Precautions:	Usage of Kerosene oil is prohibited in printing machine. It harms plate, roller, blanket and dampening system.

Instructions	**Illustrations**
1. Put both oils in separate beakers and check the viscosity of both oils	
2. Check the lubrication of both oils	
3. And finally put the standard oil in the machine oil tank.	
4. Remove the substandard oil.	
5. Then wash hands carefully with soap/detergent	

Practical Activity:

Module: A	**Perform Pre-run Maintenance**	
	Learning Unit: 1-2	**Maintain Oil Level**
	Practical Description:	**Maintain oil level as per machine specifications**
Time:	7 hours	
Equipment	Offset printing machine	
Tools	Funnel, Spanner set, Allen key set	
PPE	Proper dress, safety shoes, safety gloves	
Materials	Lubricant Oil, cloth, OEM manual	
Key Point	Always use good quality oil in Machine	
Learning Outcome:	Maintain oil level as per machine specification	
Precautions:	Ensure safety	

Instructions	**Illustrations**
1. Check the oil level of machine through magic eye	
2. Open the oil tank cap, fill the tank and check the oil level again carefully	

3. Clean the surrounding area of oil cap properly and dispose of the waste cloth	
4. Wash hands properly	

Learning Unit 1-3:

Inch Printing Machine

Overview:

This learning unit describes importance and procedure of inching process.

Inching:

Inching means the machine would move within an inch range and it is used to check if there is any problem before pre-run.

Importance of inching:

Inching is a process, which is done before pre-run to indicate if there is any tool or any metal object between the cylinders and rollers or if there is any problem in machine before we start production.

Effects of avoiding inching

Basically inching is done to indicate the following issues:

1. To check electricity phase
2. To verify if the rollers and cylinders are moving in proper manner.
3. To indicate if there is any metal object or tool between cylinders or rollers before production.
4. To avoid inching can cause accidents.

5. Do not inch printing press and wipe cylinder at the same time.
6. Return printing press to safety STOP after each inching.
7. Always loud “Clear” and wait for “Clear” response before inch or run.
8. Failure to do so may result in serious injury.

Inching procedures on offset printing machine

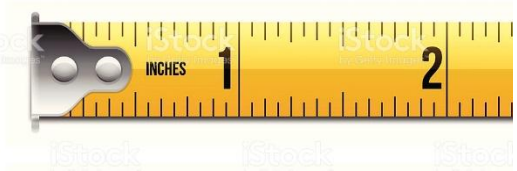
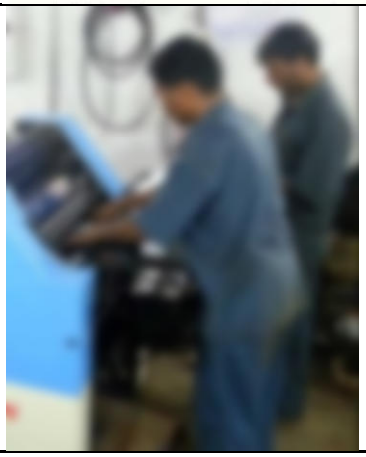
Inching is the first thing we do, after the machine is switched on, it is done to assure if machine does not has any issues or it will not cause any hassle during print-run or production.

:

Practical Activity:

Module: A	**Perform Pre-run maintenance**	
	Learning Unit: 1-3	**Inch Printing Machine**
	Practical Description:	**Perform inching procedure on printing machine as per SOP**
Time:	**8 hours**	
Equipment	Offset printing machine	
Tools		
PPE	Proper dress, safety shoes, safety gloves	
Materials		
Key Point	Avoid inching can cause accident	
Learning Outcome:	The learner will be able to perform inching procedure as per SOPs	
Precautions:	Do not inch machine and wipe the cylinder at the same time	

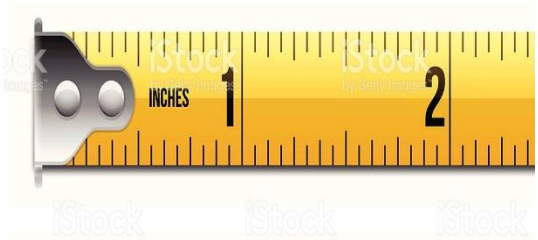
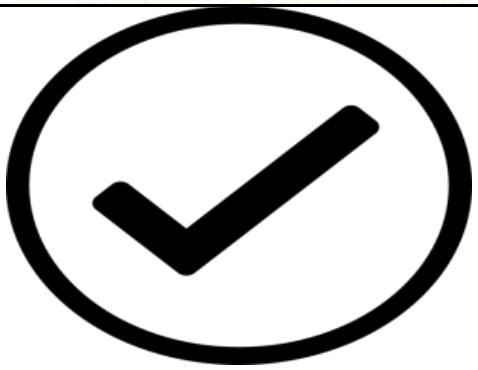
Instructions	**Illustrations**
1. Wear proper dress and shoes	

2. Switch on the machine	
3. Press inching button 1 inch only	
4. Check the machine, if any unusual sound is noticed, inform the supervisor immediately.	
5. If everything is ok then start printing	

Practical Activity:

Module: A	**Perform Pre-run maintenance**	
	Learning Unit: 1-3	**Inch Printing Machine**
	Practical Description:	Verify inching through inch printing machine
Time:	**8 hours**	
Equipment	Offset Printing machine	
Tools		
PPE	Proper dress, safety shoes, safety gloves	
Materials		
Key Point	Avoid inching can cause accident	
Learning Outcome:	The learner will be able to verify inching	
Precautions:	Do not inch machine and wipe the cylinder at the same time	

Instructions	**Illustrations**
1. Wear proper dress and shoes.	
2. Switch on the machine	

3. Press inching button 1 inch only	
4. If machine is working properly, then run the machine and take out test prints.	

Learning Unit 1-4:

Record humidity in press room

Overview:

This learning unit describes humidity, its importance and methods to manage humidity in any press room.

Humidity:

The moisture in the air is called humidity.

Importance of manage humidity in press room environment:
Any swings in temperature and humidity can cause **dimensional variations** and **loss** of substrate **flatness**.

In offset printing, the moisture content can affect the interaction between the ink to the press, the paper to the press and the ink to the paper. What you need is a higher moisture level of about 55% RH (relative humidity) in the press hall. If the RH is lower, the dry air will cause issues, such as curling, creasing and dot doubling.

In low humidity, electrostatic buildup is also common and can also cause misfeed, as well as problems with stacking, trimming and folding when the paper starts sticking together. And when the paper makes another pass through the printer, it can change shape again and cause cracking along the folds once finished.

To manage the quality of printing and substrate, you have to manage the humidity in press room

Key Benefits to manage humidity:

- The quality of printing improves due to proper humidity levels because it helps get rid of paper distortion and prevents static.
- Machine operations also become more efficient because proper humidity levels directly contribute to less downtime.
- Printing in a well-balanced, humid environment will provide consistent a level of quality and result in reduced waste and a longer life-cycle of cylinders and plates.

Humidity management procedures:

- Humidity should be recorded twice a day in press room.
- Substrate should be packed properly.
- Humidity should be recorded and mentioned in log book.
- Press room should be air conditioned.
- Doors and windows should be closed to control humidity.
- If any unusual humidity found, immediately report to the senior/Supervisor.
- If possible, put an enclosure around the press to maintain the required humidity level.

Practical Activity:

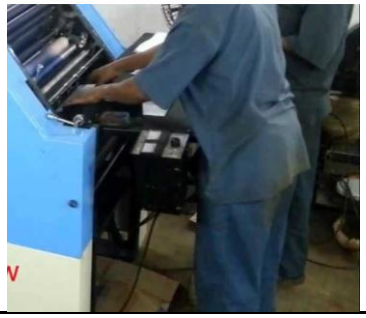
Module: A	**Perform Pre-run Maintenance**	
	Learning Unit: 1-4	**Record humidity in press room**
	Practical Description :	**Verify humidity of press room as per press room SOP's**
Time:	**2 hours**	
Equipment	Digital Humidity meter	
Tools	N/A	
PPE	Proper dress code, safety shoes	
Materials		
Key Point	The quality of printing improves due to proper humidity levels	
Learning Outcome:	Verify humidity of press room as per press room SOP	
Precautions:	Printing substrate should be packed properly	

Instructions	**Illustrations**
1. Check the humidity of the press room	
2. If the humidity is in between 40 to 60, it is ideal for the printing press room	
3. If the humidity of the press room is less than 40, inform supervisor	

Practical Activity:

Module: A	**Perform Pre-run Maintenance**	
	Learning Unit: 1-4	**Record humidity in press room**
	Practical Description:	**Apply humidity management technique in press room**
Time:	**5 hours**	
Equipment	Digital Humidity meter	
Tools	-	
PPE	Proper dress code, safety shoes	
Materials	-	
Key Point	The quality of printing improves due to proper humidity levels	
Learning Outcome:	Apply humidity management technique in press room	
Precautions:	Printing substrate should be packed properly	

Instructions	**Illustrations**
1. For comfort level printing, humidity must be from 40 to 60.	
2. Before start printing, check the humidity of press room through digital humidity meter.	
3. If humidity is less than the required standard, maintain the humidity level by adopting alternative means.	

4. Report to supervisor for desired requirements.	

Summary of the Module

- The first lithographic (printing with stone) printing was invented by Johannes Gutenberg in Germany.
- There are several types of printing

    - Letterpress Printing
    - Offset Printing
    - Flexography
    - Rotogravure
    - Screen Printing
    - Digital Printing

- There are 5 main components of an offset printing machine
    1. Feeding System: The feeding system refers to the mechanism that feeds paper or any other substrate to be printed
    2. Printing System or Cylinder: Offset presses generally use three cylinders.

        - Plate Cylinder
        - Blanket Cylinder
        - Impression Cylinder

    3. Inking System: It is made up of an ink fountain (duct), which holds the ink and a set of rollers known as the roller train.

    4. Dampening System: The dampening system is consist a set of dampening rollers. These apply the fountain solution to the plate to keep the non-image areas from getting inked.
    5. Delivery System: This is the mechanism that collects the printed substrate from the printing unit and stack it in a neat manner.
- Cleaning and tidiness can help control or eliminate workplace hazards.
- Viscosity is a measure of a fluid's resistance to flow.
- Using low quality oil in machine cause low performance of machine. Always use standard quality and grade oil and maintain oil level in machine.
- Inching means the machine would move within an inch range and it is used to check if there is any problem before pre-run.
- The moisture in the air is called humidity. Any swings in temperature and humidity can cause dimensional variations and loss of substrate flatness. Humidity should be recorded and mentioned in log book.

Frequently Asked Questions
(FAQs)

Question	Answer
1. When lithographic printing was invented?	The first lithographic (printing with stone) printing was invented by Johannes Gutenberg in Germany
2. How many kinds of offset press?	There are two main kinds of offset presses Sheet fed Web fed
3. What is humidity?	The moisture in the air is called humidity.
4. Define importance of inching.	Inching means the machine would move within an inch range and it is used to check if there is any problem before pre-run.
5. Describe the importance of oil in offset machine.	It is used to run machine smoothly.
6. How many cylinders are there in offset printing unit?	The printing unit is composed of the plate cylinder, blanket cylinder, and impression cylinder.
7. Why plate cylinder is used in offset machine	It is used to mount the plate tightly.
8. Where the plate cylinder is located?	The top cylinder on sheet fed offset presses is the plate cylinder.
9. List workplace cleaning equipment	These are kerosene oil, brush, cleaning rags/cloth, ink scrapper
10. What is the meaning of Offset?	Offset printing means, the image first “Off” then “Set” on any substrate.

11. What is Viscosity of oil?	Checking the lubrication particles in oil is called viscosity. Or Viscosity is a measure of a fluid's resistance to flow
12. For which purpose blanket cylinder is used?	To acquire image from the plate and transfer it to the substrate.

Self-Assessment

(MCQs)

Please mark the correct one from the given options. You can check your answer with the Answer Key at the end of this module

1. How many cylinders are used in offset printing machine?
    a. Eight
    b. Five
    c. Six
    d. Three
2. Checking the lubrication particles in oil is called _____.
    a. Viscosity
    b. Humidity
    c. Inching
    d. Maintenance
3. Inching is a process, which is done before_____, to indicate if there is any problem before production.
    a. Post-run
    b. Pre-run
    c. During running machine
    d. No idea
4. If the press is not clean as described in d, the machine can be _____.
    a. Damage
    b. Not able to run
    c. Destroy
    d. No idea
5. The learner makes sure to fix the _____ dampening rollers on the proper place.
    a. Dry
    b. Thick
    c. Thin
    d. Wet
6. Which of the following is NOT printing process?
    a. Offset lithography.
    b. Flexography
    c. Digital printing
    d. Calligraphy

7. Common responsibility of all people is to keep the workplace environment:

a. Tidy
b. Clean water and other spillage
c. Clear from hindrance
d. All of above

8. Which of the following is the very first routine activity on the start of a working day for an offset machine operator?

a. Perform registration
b. Manage humidity
c. Interpret Docket
d. Clean press

9. Which statement is correct regarding preventive maintenance?

a. To change only lubricant and filter timely
b. To check only fuel system timely
c. To maintain the vehicle performance at all time
d. Only to inspect and replace components

10. Which of the following kinds of maintenance could increase chances of machine operation without breaks for longer duration?

a. Preventive
b. breakdown
c. Routine
d. Emergency

Answer Key

MCQ No.	Correct Answer
1	d
2	a
3	b
4	c
5	d
6	d
7	d
8	d
9	a
10	c

OFFSET PRINTING MACHINE OPERATOR

Learner Guide

National Vocational Certificate Level 2

Version 1 - September 2018

Module-B

Module B: - Interpret Printing Instructions on Docket

Learning Outcomes:

After completion of this module the learner will be able to:

- Determine job title from docket/job card,
- Verify availability of reference specimen in docket/job card,
- Determine color sequence of job as per docket/job card requisition
- Determine coating applications on from docket/job card
- Verify conditions of plates for any physical damage,
- Determine dot percentage on printing plates,
- Verify color plates as per given reference specimen,
- Determine plate size for designated machine from docket/job card,
- Determine traceability marks on printing plate as per printing requirement
- Verify plate characteristics as per dot strip.
- Determine substrate type as per docket/job card requisition,
- Determine grain of substrate as per docket/job card requisition,
- Determine gram per square meter(GSM) value of substrate as per docket/job card requisition
- Manage inks as per docket/job card requisition
- Verify size of substrate as per docket/job card
- Verify trimming of substrate for alternate size of job as per requirement
- Verify artwork as per specimen
- Verify artwork from plates.

Learning Unit 2-1:

Determine Job Order Details

Overview:

The purpose of this learning unit is to inform the learner about docket/job card and its importance, to provide knowledge of necessity of instructions on job card and its contents (e.g. artwork, shade card, plates, ink, quantity, size and GSM of paper or board).

Job Card

A job card is a detailed description of work that is performed for a work order.

Importance of docket/job card

Interpretation of job card is very important. It enables the learner to interpret the job and sequence of the activities to be carried out during the performance of the job.

A job card is consists of:

Job title

Art work

Job type

Quantity

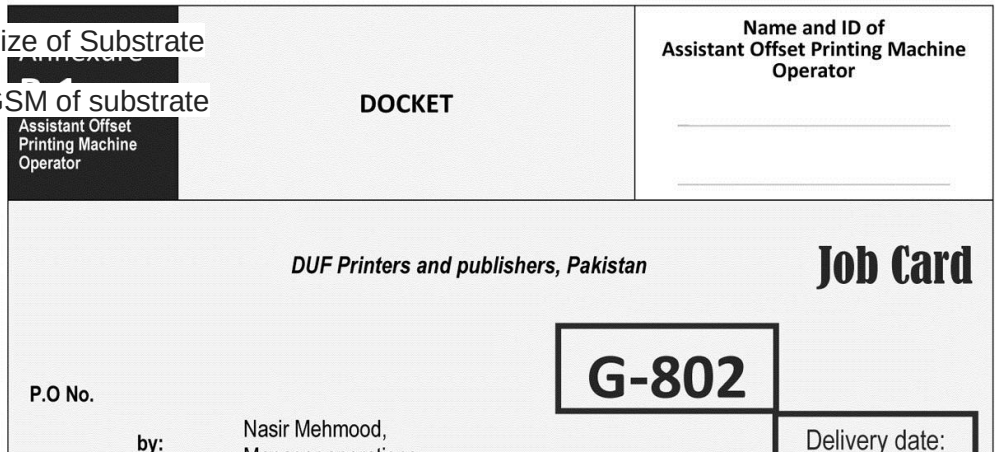
Shade card

Ink

Plates

Size of Substrate

GSM of substrate



Shade Card

A **color chart** or **color reference card** is a flat, physical object that has many different color samples present. They can be available as a one-page chart, or in the form of swatch books or color-matching fans.

Color sequencing

Ink sequence is the concept in which the process color inks are printed consecutively in the four-color printing process. In four color printing Cyan, Magenta, Yellow and Black inks are printed.

Importance of color Sequencing:

The sequence of printing is very important due to several practical reasons. Many printers prefer a substandard printing sequence of Black (K) ink in the first printing unit, Cyan (C) in the second, Magenta (M) in the third and Yellow(Y) in the fourth printing unit. In another system, Black (K) ink from the first unit is shifted to the fourth unit, if the press Operator requires a high coverage of Black (K) ink. It can be changed as per job requirement.

Application of coating:

A coating can add a layer of protection to printing. It can help prevent the ink from rubbing off on to the surface next to it

Print coatings can help your printed products stand out by making them more durable, more elegant or by bringing the reader's attention to the right spot.

Remember:

Do not use spray powder on the jobs which required coatings if mention in the job card

Types of coating:

Commonly 2 types of coating used in offset printing are:

- **Water based (Aqueous) coating:**
  Aqueous, as its name suggests, is a water-based coating. It is, like varnish, available in gloss and matte finishes, but unlike varnish it must be applied over an entire page.

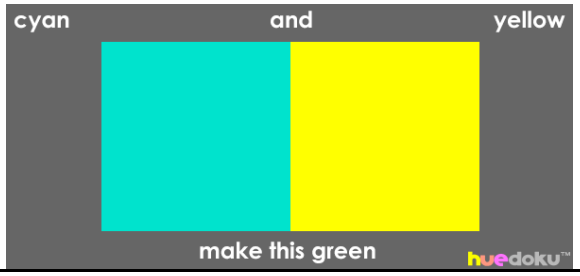
- **Ultra Violet (UV) coating:**
  UV coating is a liquid that is cured on press with an ultraviolet light. Because of the curing process, it is dry by the time it comes off press. The result is a very high gloss/matte finish.
  Always use recommended blanket for UV COATING

Special blanket for UV coating/printing

Practical Activity:

Module: B	**Interpret Printing instructions on Docket**

	Learning Unit: 2-1	**Determine Job order detail**
	Practical Description:	Prepare Green color as per provided shade card
Time:	**5 hours**	
Equipment	N/A	
Tools	Spaggel (Scrapper), Glass sheet	
PPE	Proper dress code, safety shoes	
Materials	Process Ink, Roller Wash, Cleaning cloth, Paper sheet as per job card	
Key Point		
Learning Outcome:	Learner will be able to prepare color as per job card	
Precautions:	Ensure personal and environmental safety. Properly dispose of the cleaning cloth as per press room SOPs	

Instructions	**Illustrations**
1. Mix Cyan in Yellow with the help of Spaggle (Scrapper)	
2. Take shade with finger or palm on specific paper to match with provided shade card.	

3. Ensure proper required light to observe color.	
4. Perform cleaning of glass or tray on which you made the ink.	
5. Wash your hands properly with soap.	

Learning Unit 2-2:

Verify plates as per job requirement

Overview:

This learning unit deals with conditions of plate for any physical damage, dot percentage on plates, verification of color plates as per given reference specimen, measure plate size for designated machine from docket/job card. It also deals with traceability marks on printing plates as per printing requirement and verifies plate characteristics as per dot strip.

Traceability marks

It is used for identification of machine or concerned operator to fulfill the task.

Printing Plates:

Printing plates are used to transfer an image to paper or other substrates. The plates are usually made of a thin (up to 0.3 mm), light sensitive coated aluminum sheets exposed through films or direct through computer.

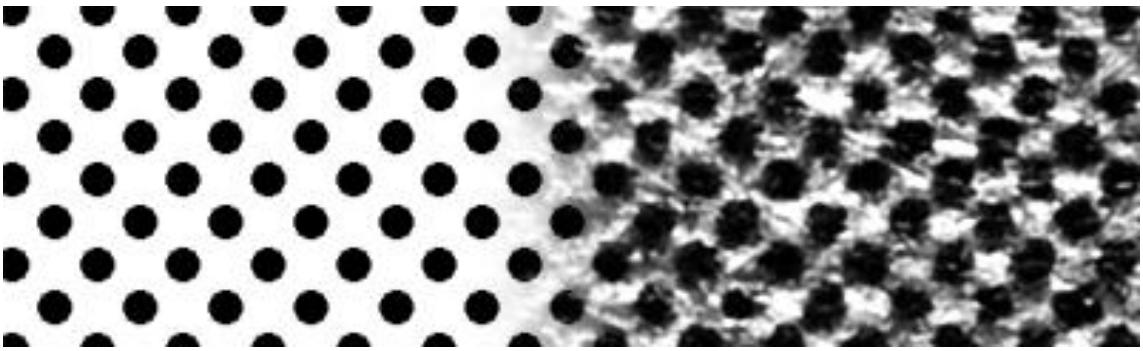
Types of Printing Plates:

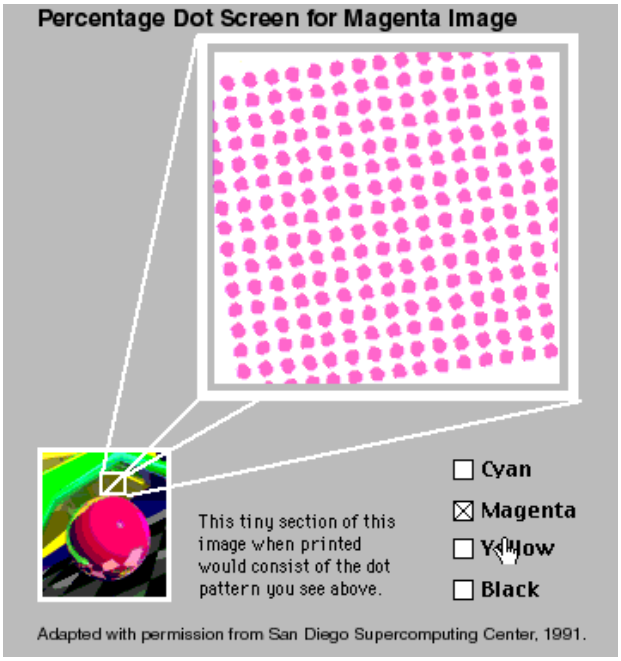
There are 3 types of plates,

1) P.S Plates
2) Thermal plates
3) UV plates

Dot Percentage:

The Dot Percentage is the number of dots mentioned on the screen of the required job. It is defined as the increase in the area fraction (of the inked or colored region) of a halftone dot during the prepress and printing processes. Total dot gain is the difference between the dot size on the film negative and the corresponding printed dot size. For example, a dot pattern that covers 30% of the image area on film, but covers 50% when printed is said to show a total dot gain of 20%.





Precautions to be taken in handling of printing plates:

Printing plates handling is a very sensitive matter, and the following precautionary measures are required to be taken during handling of the printing plates.

1) Prevent it from bending.
2) Avoid rubbing and scratching from image area of printing plates
3) Ensure handling of printing plates with clean hands.
4) PS and UV Plates must be protected from UV light and sun light.
5) Keep them in dust free area.
6) The storage area temperature may range between 40-100° F(4-38°C)
7) Do not store near heat source and heating vent.
8) If plates are stacks, they should be interleaved with paper or foam from raw material packing.

Practical Activity:

Module: B	**Interpret printing instructions on docket**	
	Learning Unit: 2-2	**Verify plates as per job requirements**
	Practical Description:	Perform verification of plate as per job card/docket
Time:	**5 hours**	
Equipment	Plate reader	
Tools	Magnifying/Eye glass	
PPE	Proper dress code, safety shoes	
Materials	Printing plate as per given docket	
Key Point	Verify the plate	
Learning Outcome:	The learner will be able to check the plate	
Precautions:	Avoid rubbing and scratching from image area of printing plates	

Instructions	**Illustrations**
1. Collect the desired printing plates	

2. Observe the plates with naked eye.	
3. Check the plate with the help of eye glass on the image area for any damage.	
4. Check dot percentage with the help of plate reader	
5. Replace the damaged plates	

Learning Unit 2-3:

Verify material quality

Overview:

This learning unit is related to determine types, weight of substrate as well as manage ink according to Job card.

Substrate for offset printing:

Any material with a surface that can be printed or coated is called substrate. Although the most common printing substrate is paper, substances such as plastic, metal, and wood are also classified as substrates. Major substrates used in offset printing are as under:

Coated Paper

Uncoated Paper

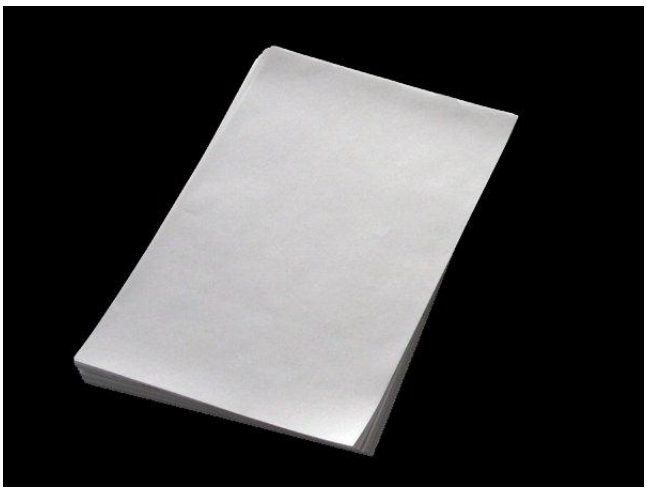
Coated Card

Uncoated Card

Duplex board

Bleach board

Sticker paper



GSM values:

GSM value means gram per square meter. The weight of paper is measured in gsm. Effectively, this is the thickness of the paper: Most printing paper has a gsm between 40 and 150. Anything equal and above 170 is considered as card.

Effects of variation in GSM value:

Variation in GSM value of substrate, affects the quality of printing.

Although any weight of paper can be used for any printed item, there are generally a few unwritten guidelines we follow in order to make sure the finished product is suitable for its purpose.

Practical Activity:

Measure weight of substrate (paper/card) as per instructions

Required Material:

Substrate as per job card

Round Cutter

Weighing scale

Note book

Pen/Pencil

Instructions:

1. Collect the desired substrate
2. Adjust substrate on round cutter
3. Cut the required substrate on round cutter.
4. Transfer the cut piece on substrate weighing scale
5. Perform weighing of substarte on scale
6. Maintain record of weighing

Grain of substrate:

The direction or structure of paper fibers is called grain. The directions of fibers in a sheet or web of paper must be a consideration in all printing processes. Direction of grain becomes important when feeding the paper through the press and during some finishing procedures.

In most cases, sheets are fed through a press with the grain parallel to the cylinder of the offset press. The stock is referred to as grain long (grain is parallel to the paper's long side). During binding, the grain should be parallel to the binding edge so the fibers will not break. Grain short (grain is parallel to paper's short side) is a quality that indicates the grains run across the paper.

Determination method of substrate grain:

If you are uncertain of the grain direction, there are following techniques:

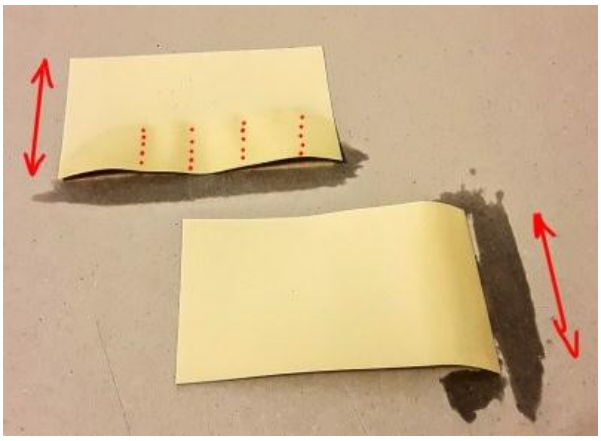
1. The underlined dimension on a package of paper specifies the direction of the grain.

2. Determine grain direction by “feel.”

- Collect the desired substrate
- Take the sheet of paper in your hands and gently curl/bow the paper towards the middle
- First curl the substrate vertically
- Then curl the substrate horizontally
- The grain direction is determined by the direction that bends with less resistance.

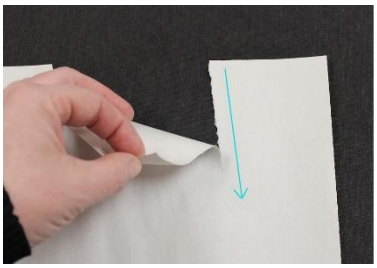
3. Determining grain direction by moisturizing a sheet of paper

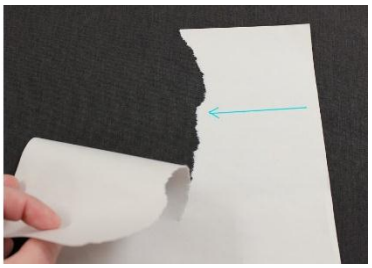
- Collect the desired substrate
- Cut a 6” inch long piece from vertical and horizontal side of substrate
- Applying moisture to a side of paper
- Observe if the whole moistened side starts to curl upwards or downwards, that means grain goes along that side. If the side becomes wavy, grain follows perpendicular direction.



Determining grain direction by tearing a sheet of paper

- Collect the desired substrate
- Tear the sheet in vertical direction
- Tear the sheet in horizontal direction
- Zigzagged tear is the wrong direction of grain.
- Straight tear is the right direction of desired grain.
- Record the right direction of the grain.





4. Another way to find grain direction is:

- Cut two strips of paper, each in a different direction.
- Lay the strips over a rod or straight surface.
- The sheet that curves the most is across or at right angles to the grain. Usually, a sheet of paper will fold easier and form a more even edge with the grain.

Application of coatings:

Coating used to protect color of ink applied on surface of substrate.

Types of coatings:

Commonly 2 types of coating used in offset printing are:

- Water based
- Ultra violet (UV) coating

Learning Unit 2-4:

Verify substrate sizing

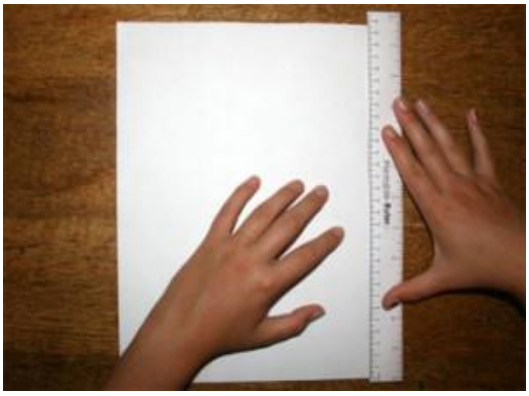
Overview:

This learning unit deals with verification of size of substrate and trimming of substrate for alternate size of job as per docket/job card. The docket/job card will include specification of the substrate size. Same size should also be the impression on the printing plate and also the printing press specified size should be more than or equal to the substrate size.

For example: Artwork, shade card, plates, ink, quantity, size and GSM of paper or board (coated or uncoated) to avoid any loss of substrate.

Method of checking substrate size:

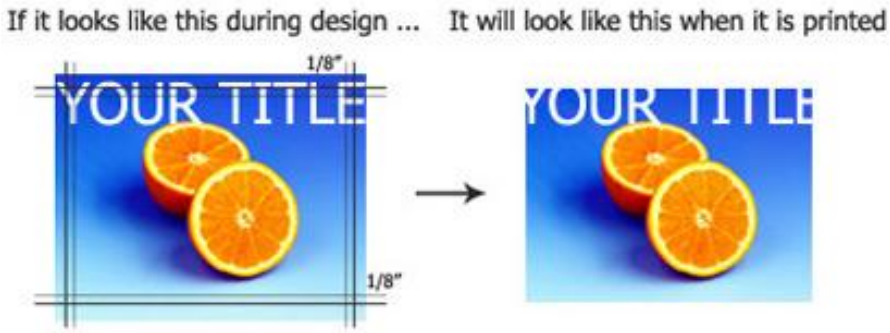
- The paper size is mentioned on packing of paper ream for sheet-fed.
- The same can be verified through a full-size ruler by taking a sheet of paper from the ream and measuring it.



Effect of size variation on substrate:

If the size is different from the specified size, the impression will not be in place where it was supposed to be, which can result in:

- Missing matter

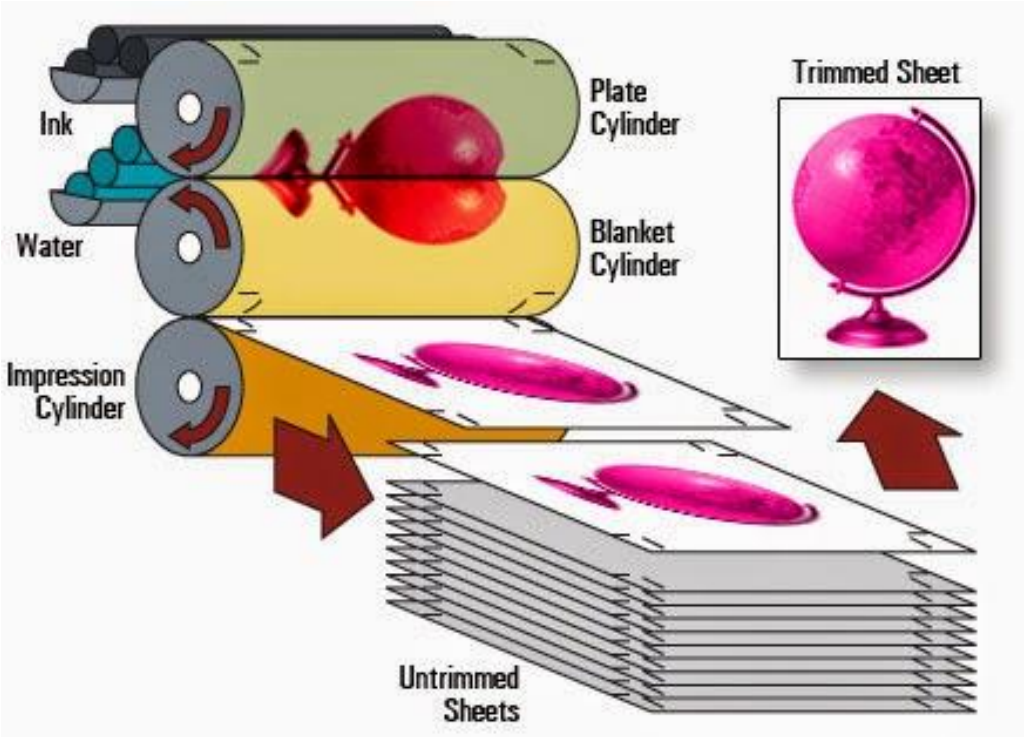


- Post-press process issues
- Paper missing during print run
- Frequent machine stops during production

Substrate trimming:

Cutting and trimming are procedures which affect every print job at some point in its journey from blank stock to finished product. While cutting reduces sheets to a desired size, trimming further refines the printed document.

Verify availability of desired size of substrate according to the docket/job card.


Ink
Water
Plate Cylinder
Blanket Cylinder
Impression Cylinder
Trimmed Sheet
Untrimmed Sheets

Activity:

Checking of substrate size

Tools/Material

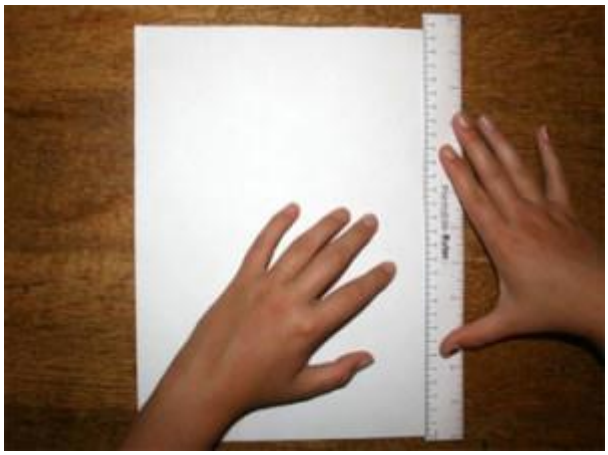
- Substrate
- Docket/job card
- Printing plate
- Measuring ruler

Outcome

After this activity student will be able to check size of the substrate.

Instructions:

1) Collect the desired docket/ Job card
2) Collect the plate of the job
3) Collect the substrate
4) Put the ruler to the substrate and verify if it is as per docket/job card, machine size and plate impression
5) Immediately report to the Supervisor/Senior if there is an abnormality
6) Continue with the printing process



Learning Unit 2-5:

Verify artwork

Overview:

This learning unit deals with verification of art work as per specimen provided in docket/job card and printing plates. Inside the docket, artwork from the job being printing is available.

Artwork in printing industry:

Any design produced primarily to give the client an approximate idea of what the printed piece will look like. It is the latest approved printed copy of work being printed. Artwork has been through spell check and color verification as per customer requirements.

The art work should be looked to verify the following points:

- Number of colors in job with plates
- Placement of printing on substrate as per artwork

Activity:

Checking of artwork and plates as per docket/job card

Tools/Material

- Docket/job card
- Printing plate

Outcome

After this activity student will be able to check the art work and the printing plates

Instructions:

1) Collect the desired docket/ Job card
2) Collect the plate(s) of the job
3) Check the number of colors on the job card and the number of color plates are same
4) Report if there is any difference
5) Continue with the printing process

Summary of the module:

- A docket/job card is a detailed description of work that is performed for a work order. It enables the learner to interpret the job and sequence of the activities to be carried out during the performance of the job. A job card consists of artwork, shade card, plates, ink, quantity, size and GSM of paper or board (coated or uncoated).
- Color sequence is the concept in which the process color inks are printed consecutively in the four-color printing process. In four color printing Cyan, Magenta, Yellow and Black inks are printed.
- A coating can add a layer of protection to printing. There are two types of coating; Aqueous (water based) and UV (ultra violet).
- Printing plates are used to transfer an image to paper or other substrates. There are 3 types of plates; P.S Plates, Thermal plates and UV plates. These plates are very sensitive, so precautionary measures must be taken during handling of the printing plates.
- The Dot Percentage is the number of dots mentioned on the screen of the required job.
- Substrate is a material with a surface that can be printed or coated. The most common printing substrate is paper/card. The weight of paper is measured in GSM. Effectively, this is the thickness of the paper. GSM stands for gram per square meter. If the substrate size is different from the specified size, the impression will not be in place where it was supposed to be. Verify availability of desired size of substrate according to the docket/job card.
- The direction or structure of paper fibers is called grain of substrate. There are several techniques to determine the grain of substrate.
- Art work is any design produced primarily to give the client an approximate idea of what the printed piece will look like. It should also be verified according to the docket/job card.

Frequently Asked Questions
(FAQs)

Question	Answer
1. What does CMYK mean?	CMYK refers to the 4 inks used in color printing: cyan, magenta, yellow and key (black).
2. Why interpretation of job card is very important?	It enables the learner to interpret the job and sequence of the activities to be carried out during the performance of the job.
3. Which color sequence is most common in offset printing?	CMYK is the most common standard for offset printing
4. What is (Aqueous) coating?	It is Water based coating.
5. Why traceability mark is used for?	It is used for identification of machine or concerned operator to fulfill the task.
6. Why printing plates are used in printing?	Printing plates are used to transfer an image to paper or other substrates
7. What is GSM value?	GSM value means gram per square meter.

Self-Assessment

(MCQs)

Please mark the correct one from the given options. You can check your answer with the Answer Key at the end of this module

Q 1: What information do you get out of shade card?

a) Acceptable range between Light, standard and dark variation
b) Correct text
c) Design approval
d) Job size

Q 2: In this sequence of printing, which is the last color? Cyan, Magenta, Yellow and:

a) Blue
b) Black
c) Green
d) Red

Q 3: Which of the coating is NOT used in offset printing?

a) UV gloss varnish
b) Water based gloss coating
c) Over print varnish
d) Powder coating

Q 4: Which is the irrelevant information for the Docket/Job card?

a) Job name
b) Job Quantity
c) Number of plates
d) Quotation detail

Q 5: What is art work?

a) Ink requirement
b) Maintain ink quantity
c) Design of job
d) Quantity of sheets

Q 6: What is Text approval used for?

a) To check ink shade
b) To check text, font and spelling
c) To check L*a*b* values
d) To check density

Q 7: What is job card used for?

a) To give instruction for printing
b) To obtain quotation
c) To obtain text approval from customer
d) To make final invoice

Answer Key

MCQ No.	Correct Answer
1	a
2	b
3	d
4	d
5	c
6	b
7	a

OFFSET PRINTING MACHINE OPERATOR

Learning Guide

National Vocational Certificate Level 2

Version 1 - September 2018

Module-C

Module C: - Make Ready Print

Learning Outcome:

After completion of this module the learner will be able to:

- Prepare substrate according to docket/job order
- Feed substrate into feeder section in order
- Punch plate from headlay according to marking
- Bend plate from endlay side by measuring it on the machine
- Mount plate on plate cylinder as per procedure
- Adjust sidelay according to job requirements
- Adjust sidelay for errorless registration
- Adjust edge of the papers according to sidelay mark
- Adjust headlay according to substrate size
- Adjust headlay as per job requirement.
- Adjust headlay according to substrate size
- Adjust headlay as per job requirement.
- Adjust delivery setting according to substrate size
- Verify plate cylinder packing according to sops
- Verify blanket cylinder packing according to sops
- Verify impression cylinder according to substrate.
- Verify smooth travelling of substrate from feeder till delivery section
- Verify registration of job as per sops

Learning unit 3-1:

Perform Machine Feed

Overview:

This learning unit is concern with preparation of substrate as per docket or job order and identification of printing side as per given specimen.

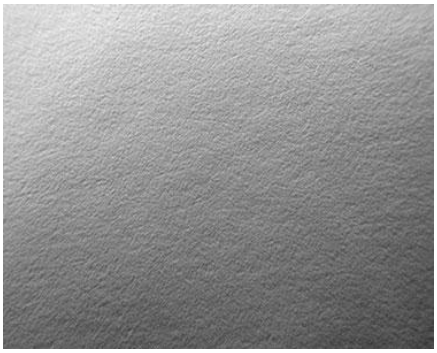
It also describes the steps of loading paper on the feeder section.

> Remember:
>
> "Before anything else, preparation is the key to success".
>
> Alexander Graham Bell

Identification of printing side as per given specimen:

Paper is typically packed print side up in the box. If you have the box handy, compare your paper in-hand to some from the box. You might be able to match the sides with a quick examination.

If that does not work, take a close look at the paper under bright light. The coated side should look more uniform with an even pattern. The back will look more uneven and possibly rough. In some cases you will be able to make out the fibrous structure of the paper stock.

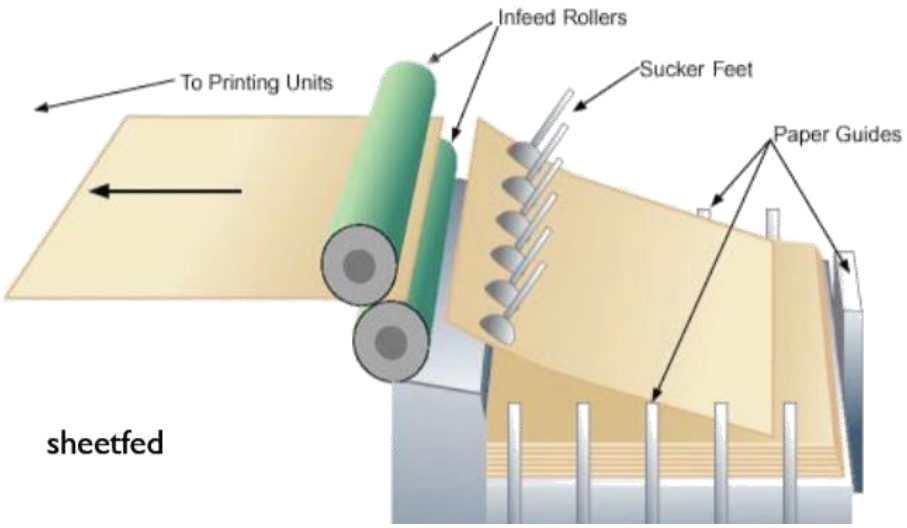


Front

back

Some substrate have two sides, others have only one which can be printed on. For example, when using bleach card, one side is glazed and the other is not. It is very important to identify the printable side of the complete feed.

Steps of loading paper and the feeder



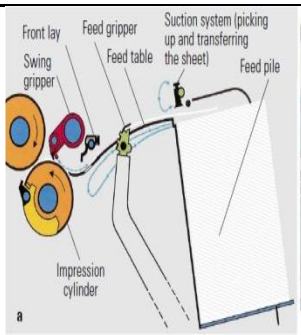
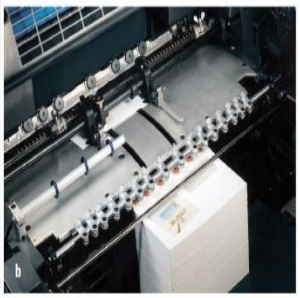
Loading of substrate to the feeder require a proper procedure. The following steps are to be followed:

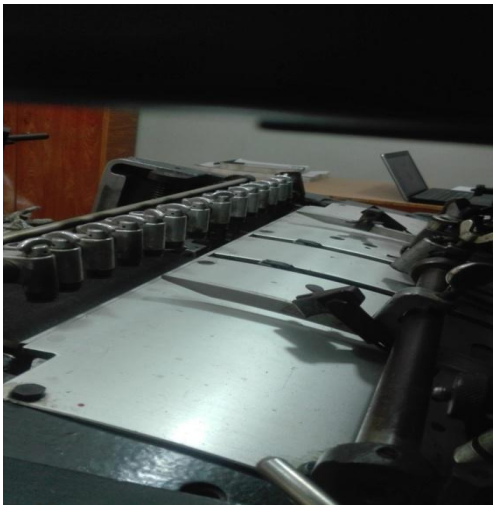
- Lower the pile table position
- Make sure that the pile of substrate is aligned with the center of the pile-table
- Position the pile guide as per the substrate size
- Fanning of substrate is to be done before loading can start
- Load the substrate on the pile-table
- Adjust the height of the pile table as per feeder of the machine
- Make sure that the suckers are set according to substrate and size

Practical Activity:

Module: C	**Make ready print**	
	Learning Unit: 3-1	Perform machine feed
	Practical Description:	Feed substrate into the feeder section
Time:	**30 min**	
Equipment	Working/pile table, Offset printing machine	
Tools	Spanner set, Allen key set, Ruler	
PPE	Proper dress, safety gloves, safety shoes,	
Materials	Ready substrate	
Key Point	Paper should be aligned at the center of pile table	
Learning Outcome:	Learner will be able to feed substrate into feeder section in order	
Precautions:	Make sure that the alignment of paper is not disturbed during fanning process	

Instructions	**Illustrations**
1. Collect the substrate	

2. Fanning of substrate is to be done before loading can start	
3. Lower the pile table position	 
4. Make sure that the pile of substrate is aligned with the center of the pile-table	
5. Position the pile guide as per the substrate size with the help of ruler	

6. Load the substrate on the pile-table	
7. Adjust the height of the pile table as per feeder of the machine. 8. Make sure that the suckers are according to substrate size	

Learning unit 3-2:

Mount printing plates on plate cylinder

Overview:

This learning unit will describe the purpose of punching machine, the position of plates inlay and the steps required for plate mounting procedure. The plate cylinder is the top priority for good quality printing. Both water and ink are transferred to the plate cylinder and further to the blanket cylinder.

Purpose of plate punching machine

Plate punching machine is an accessory of printing machine. Primarily used for registration purpose. It is used to punch the plate because without punching the plates cannot be mounted on the plate cylinder whereas some of the conventional printing machine does not require punching. Plate punching system is used to save a lot of time in proper registration of colors.

Position of plates end lay to ensure proper bending

A plate bender is used to bend the end lay of the plate. End lay bending must be accurate in order to ensure correct color registration, especially when printing multi colors. Also ensure that the plate is punched before end lay is bent. Plate should be placed face-side up. And the end lay should be bent at an angle of 90$^{o.}$

Steps of plate mounting procedure

Precaution:

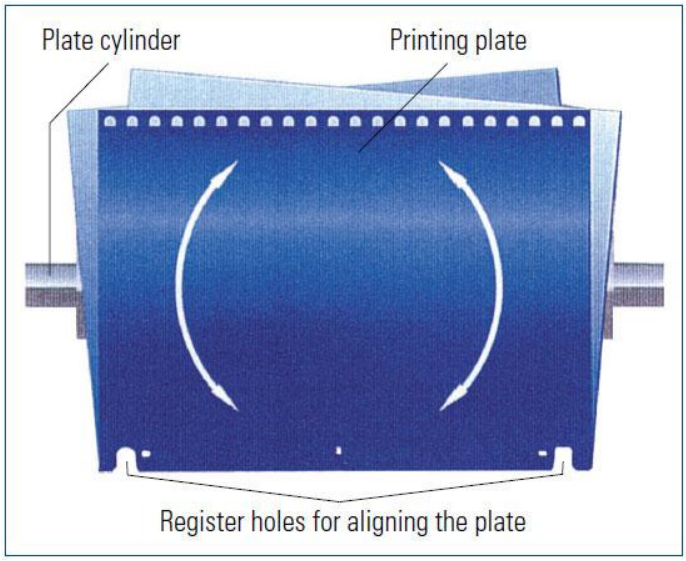
To handle printing plates, extreme care is needed because even small scratches on the plates would be visible in the printed image

- The plate is examined for damage or other faults through visual confirmation
- Plate caliber is measured and packing is prepared according to machine plate cylinder undercut
- Cylinder cleanliness must be ensured
- Plate is to be placed so that center of the plate and center mark of the plate cylinder coincide
- Leading edge of the plate is to be inserted into the leading edge clamp of the plate cylinder.
- The clamp bar is tightened from bite screw with the help of machine-key
- The ready packing of the sheet is to be inserted between the cylinder body and plate.
- Lock lever is to be pushed clockwise which is present in the clamp so that it holds the plate, and tightens the plate.
- Operating lever is to be moved to the impression ‘ON’ position. This position makes the plate to firmly attach with the cylinder body due to the pressure given by the impression cylinder while inching.
- Machine is inched slowly so that the trailing edge of the plate reaches the trailing edge of the clamp bar in the plate cylinder.
- The trailing edge of the plate should be inserted into the trailing edge of the plate cylinder clamp bar.
- The operating lever is moved to its original position. Thus the plate is mounted in the plate cylinder for printing.

For printing machines with automatic plate mounting, inching is done automatically when mounting button is pressed. The cylinder stops at the leading edge of the plate cylinder automatically.

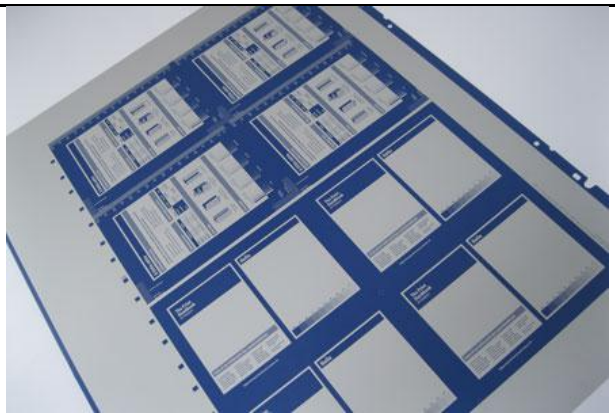
The plates are usually aligned in relation to the plate cylinder at their register holes. If the print image is copied at an angle onto the plate or the plate is clamped at an angle on the cylinder, this cannot be compensated for by adjusting the lateral and circumferential register; the plate needs to be realigned on the cylinder surface. On many presses, the plate cylinders can be cocked to achieve this.

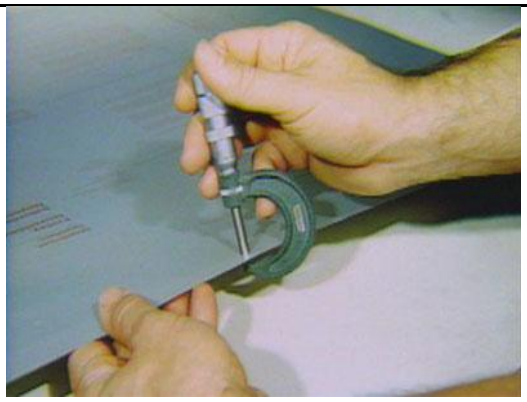
The plate cylinder must roll very accurately on the blanket cylinder. Slight inaccuracies of only a few microns could lead to clearly visible streaks in homogeneous halftone tints at right angles to the direction of printing, which is why there is cylinder bearer contact between the plate and blanket cylinders.

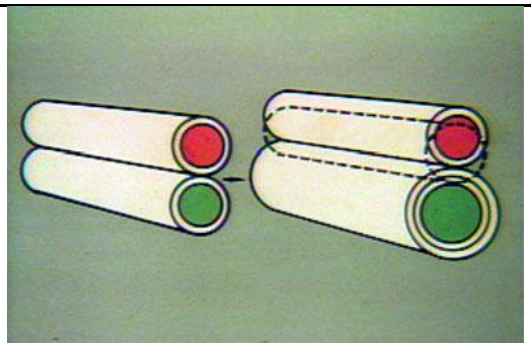


Practical Activity:

Module: C	**Make ready print**	
	Learning Unit: 3-2	Mount printing plates on plate cylinder
	Practical Description	Prepare and mount plate on plate cylinder
Time:	**15 min**	
Equipment	Offset printing machine	
Tools	Spanner, L-key, Micrometer	
PPE	Safety gloves, safety shoes, proper dress	
Materials	Printing plates, Packing sheet	
Key Point	Punch and bending must be accurate to ensure proper registration especially when printing multi colors	
Learning Outcome:	Learner will be able to mount the plate on plate cylinder	
Precautions:	Plate must be handled carefully to avoid scratching or denting	

Instructions	**Illustrations**
1. Collect the printing plates	

2. Examine the plate for damage or other faults	
3. Measure plate caliber and prepare packing according to machine plate cylinder undercut	
4. Place the plate on the bending slot face front from gripper side and align the plate to the center of the bending slot through plate bar	
5. Center the plate center mark to coincide with the center mark present at the cylinder.	

6. Insert the packing sheet of required thickness between the cylinder body and plate.	
7. Press the lock lever present in the clamp so that it holds the plate, and tighten the side belts.	
8. Remove plate from bending slot and place into the plate bar from head lay side and fix it by spanner. Then slowly move the cylinder anti-clockwise and fix end lay side into the plate bar which was bent earlier	
9. Move the operating lever to the impression 'ON' position. This position makes the plate to firmly attach with the cylinder body due to the pressure given by the impression cylinder while inching.	
10. Inch the machine slowly so	

that the trailing edge of the plate reaches the trailing edge of the clamp bar in the plate cylinder.	

Learning unit 3-3:

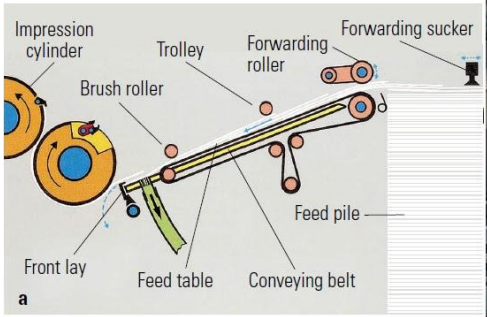
Adjust Machine Sidelay

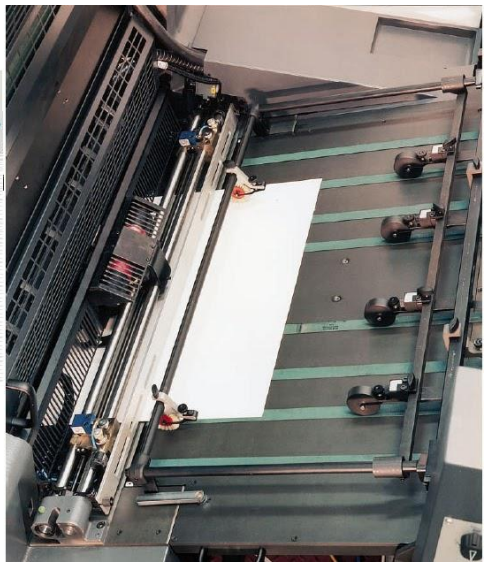
Overview:

This learning unit describes the purpose of sidelay in printing machine, the steps involved for sidelay adjustment, color registration and positioning of substrate for perfect registration

Purpose of sidelay in printing machine:

The purpose of sidelay in the printing machine is to keep a perfect registration of the substrate from the pin side. In the sidelay a movable bar and a rotating wheel is present. The sidelay can be moved sideways in the bar and fixed in correct position for the required placement of image over the substrate. Due to the movement of the bar, the paper gets pulled and registered in the lay piece of sidelay.





Steps involved in sidelay adjustment:

Following steps are involved in sidelay adjustments

- Substrate is loaded on the feeding system
- Height of the pile is adjusted
- Air suckers are adjusted according to the substrate
- Adjustment of the Air steam/ Air splitter is made
- Adjustment of sidelay pin is made according to the required range as per standard instruction.
- Verify the hassle free paper run.

Color registration:

Following steps are involved in color registration:

- Substrate should be cut in a 90 degree angle
- Ensure the substrate should not be wavy.
- The substrate should be free from dust and static charges.
- Sidelay and Head lay should be adjusted perfectly and rechecked before print run
- The ink roller should be cleaned for optimal color.
- Adjustment of printable area must be as per post press requirement mentioned in docket.
- Registration must be ensured by repeating the printing of same few printed sheets.
- Desired ratio of color should be ensured.

Practical Activity:

Module: C	**Make ready print**	
	Learning Unit: 3-3	Adjust Machine Sidelay
	Practical Description:	Sidelay should be adjusted according to substrate size.
Time:	**2 hours**	
Equipment	Offset Printing Machine	
Tools	Allen Key	
PPE	Proper dress code, safety shoes	
Materials	Substrate, Offset ink, Roller wash, Plate cleaner, Cleaning rags	
Key Point	Ensure that sidelay is tightened perfectly.	
Learning Outcome:	Adjust sidelay according to the job requirement for errorless registration Adjust edge of the papers according to sidelay mark	
Precautions:	Substrate should be aligned from all sides Substrate should not be wavy.	

Instructions	**Illustrations**
1. Load substrate to the feeding system and adjust pile height	

2. Adjust substrate suckers according to its thickness	
3. Adjust Air steam/ Air splitter	
4. Adjust sidelay pin according to the required range and verify the paper for hassle-free run.	

Learning unit 3-4:

Adjust machine Headlay

Overview:

This learning unit deals with the adjustment of headlay according to substrate size as per job requirement and it also describes the procedure and importance of headlay adjustment required for printing machine.

Purpose of headlay in printing machine:

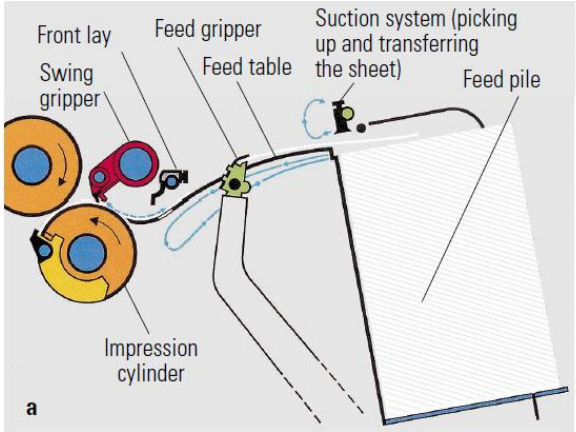
The purpose of headlay in the printing machine is to keep a perfect registration of the substrate from the frontlay side.

Safety:

- Do not touch headlay during print run
- Never make any adjustment during print run

Importance of headlay adjustment:

Headlay adjustment is very important, as it keeps the substrate to travel straight inside the printing unit from feeding section during printing process. It is obvious that without adjustment of headlay the quality of printing cannot be maintained.



Procedure of headlay adjustment

The following procedure is adopted to adjust the headlay;

a) Substrate is loaded on the feeding system
b) Height of the pile is adjusted
c) Substrate sucker are adjusted according to the substrate
d) Adjustment of the Air steam/ Air splitter is made
e) Adjustment of Headlay is made according to the required substrate size.
f) Verify the headlay adjustment for hassle free run.

Practical Activity:

Module: C	**Make ready print**	
	Learning Unit: 3-4	Adjust Machine Headlay
	Practical Description:	Adjust Headlay as per substrate size.
Time:	**15 min**	
Equipment	Offset printing machine	
Tools	Allen key set, Spanner set	
PPE	Safety gloves, safety shoes, proper dress	
Materials	Paper/substrate	
Key Point	Adjustment of headlay according to substrate size	
Learning Outcome:	Learner will be able to adjust headlay as per substrate size	
Precautions:	Do not touch headlay during print run	
	Never make any adjustment during print run	

Instructions	**Illustrations**
1. Collect the desired substrate and load it on the feeding system	

2. Adjust height of the pile	
3. Adjust sucker according to the substrate	
4. Adjust Air steam in Air splitter as per substrate	
5. Verify headlay adjustment of printed sheets by reprint the same few previous sheets.	

Learning unit 3-5:

Adjust machine Feeder

Overview:

This learning unit covers the knowledge and skills required for adjustment of machine feeder. The main function of the feeder head is, to separate the sheets and pass them one by one to the printing unit. Suckers, blowers, sheet separator, strips, photocell (double sheet detector) etc. are present and adjusted for the correct passing of substrate.

Effects of wrong feeder adjustment:

- Substrate will not be transferred to printing unit correctly.
- Wastage of substrate
- Blanket can be damaged
- Plate can be damaged
- Machine can be damaged

Procedure of feeder adjustment:

Feeder adjustment is made as per below given detail/steps:

- Adjust the sheet separation unit as per substrate
- Pile is raised to the feeding position.
- Pile height control is adjusted.
- The vacuum air control is set according to the substrate.
- Position of the air blast nozzle is set
- Adjustment of suckers and blowers
- Double sheet detector is adjusted according to substrate
- The function of double sheet detector should be verified by putting double sheet.
- Alignment of substrate should be verified.

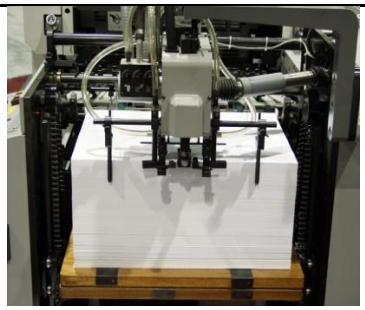
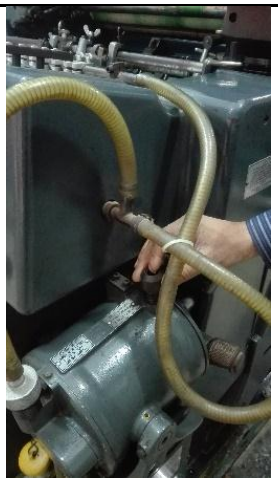
Handling and care of printed and unprinted paper

a) Careful handling of substrate before and after printing should be ensured.
b) In case of work and turn (back side) printing substrate should be feed as per opposite sidelay mark.
c) Flatness of substrate should be ensured.

Practical Activity:

Module: C	**Make Ready Print**	
	Learning Unit: 3-5	Adjust Machine Feeder
	Practical Description:	Set feeder according to substrate
Time:	**30 min**	
Equipment	Offset Machine	
Tools	Allen Key set, spanner set	
PPE	Safety gloves, safety shoes, proper dress	
Materials	Substrate	
Key Point	Substrate should be flat. Ensure proper fanning of substrate.	
Learning Outcome:	Learner will be able to set feeder according to substrate	
Precautions:	Careful handling of substrate shall be ensured	

Instructions	**Illustrations**
1. Collect the desired substrate according to Docket / Job card	

2. Adjust the sheet separation unit as per substrate	
3. Pile is raised to the feeding position. Adjust the pile height	
4. Set the vacuum air control according to the substrate.	
5. Set position of the air blast nozzle and adjust air in suckers and blowers	

6. Adjust double sheet detector according to substrate	
7. Verify the function of double sheet detector.	
8. Verify alignment of substrate.	

Learning Unit 3-6:

Adjust Paper Delivery

Overview

This learning unit covers the knowledge and skills required for the adjustment of delivery system by job size, air vacuum, side joggers and delivery fan system as per substrate.

It also elaborates effect of wrong adjustment of side joggers.

The adjustment of delivery by job size:

Following are the steps for adjusting delivery by job size:

1) Adjust the substrate on the delivery
2) Verify the center point of the substrate.
3) Adjust backlay according to substrate size.
4) Adjust side joggers according to the substrate size.
5) Perform paper run for gripper adjustment.
6) Adjust fan as per substrate size.

Remember:

After adjustment, none of the machine parts be left loose/ unlocked.

Effects of air vacuum adjustment in delivery system:

Air vacuum adjustment in delivery system is done for perfect pile of substrate in the delivery.

High speed production would be impossible without air vacuum adjustment.

Effects of wrong adjustment of side joggers:

Following are the effects caused by wrong adjustment of side joggers:

1) the pile will be inaccurate
2) the edge of the substrate can be wavy
3) In case of improper pile it will cause issues in post-production activities.

Advantages of delivery fan adjustment:

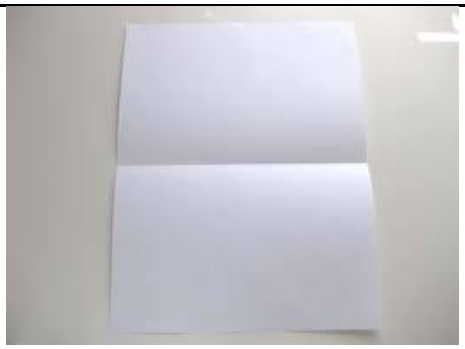
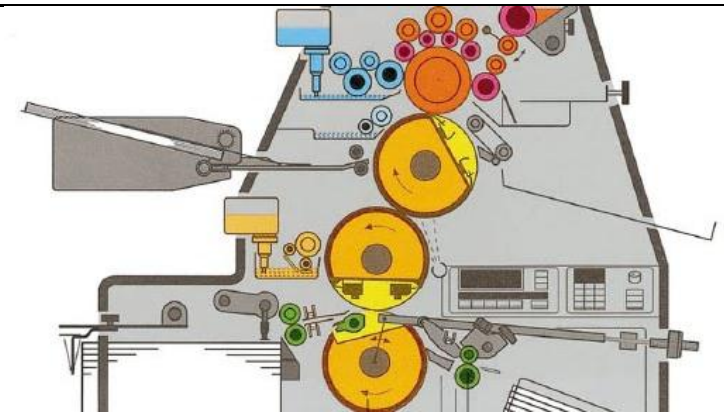
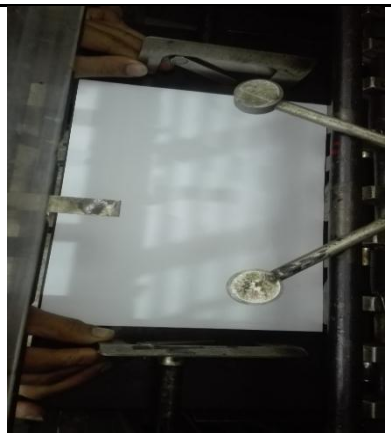
Following are the advantages of fan adjustment in delivery system.

1) Substrate travels smoothly in the delivery
2) It makes accurate pile
3) Helps in paper gathering
4) In case of high speed production it helps substrate adjustment in the delivery.

Practical Activity:

Module: C	**Make ready print**	
	Learning Unit: 3-6	Adjust paper delivery.
	Practical Description:	Delivery should be adjusted according to substrate size.
Time:	45 min	
Equipment	Offset printing machine	
Tools	Spanner, Allen key set	
PPE	Proper dress code, safety shoes, safety gloves	
Materials	Substrate	
Key Point	Ensure the delivery is accurately adjusted to substrate size.	
Learning Outcome:	Learner will be able to adjust substrate delivery.	
Precautions:	After adjustment none of the machine part be left loose/ unlocked.	

Instructions	**Illustrations**
1. Adjust the substrate on the delivery	

2. Verify the center point of the substrate.	
3. Adjust backlay according to substrate size.	
4. Adjust side joggers according to the substrate size.	
5. Perform paper run for gripper adjustment. Adjust fan as per substrate size.	

Learning Unit 3-7:

Adjust cylinder's impression

Overview:

This learning unit covers the knowledge and skills required to verify plate cylinder packing and blanket cylinder packing according to OEM, as well as impression cylinder according to substrate. It describes the printing on substrate with correct setting of impression cylinder.

Types of Packing Sheet

The process of inserting paper, plastic, or other material underneath an offset press plate or blanket is referred as "packing".

There are 2 types of packing sheet

a) Branded calibrated packing sheets
b) Unbranded non calibrated packing sheets (offset paper).

Blanket Packing:

The reasons for packing are as follows:

- it allows for a wide use of different plate and blanket thicknesses,
- it enables the printing pressure to be varied, depending upon the desired print
- it makes an impact on print by contraction and expansion during printing

Calculating Blanket to Plate Congestion:

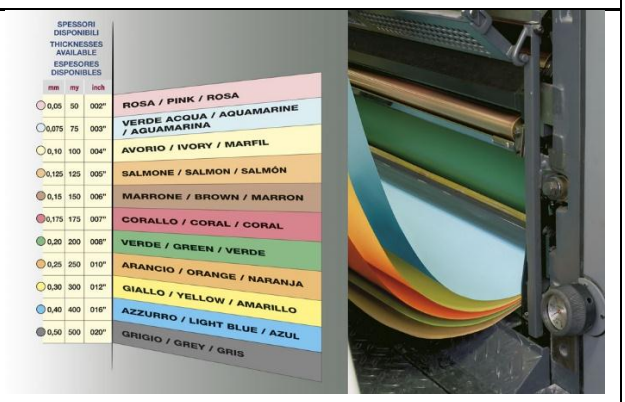
Formula: (Required plate height over bearer) + (plate cylinder undercut) - (plate thickness) = (required packing).
Let's look at an **example.** As we established, the required plate height over bearer is .001". Let's say the undercut of your plate cylinder is .020". Your plate is .012. That would give you the following: (0.001) + (0.020) - (0.012) = (0.009). Your packing should be .009".

Printing on substrate with correct setting of impression cylinder:

Impression cylinder is the part of an offset printing press which carries the paper or other substrate through the printing unit and beneath the inked press blanket.
The impression cylinder also provides a hard backing which allows the blanket to press a strong, solid impression on the paper.

Practical Activity:

Module: C	**Module Description**	
	Learning Unit: 3-7	Adjust cylinder impression
	Practical Description:	Perform plate cylinder packing according to OEM
Time:	**15 min**	
Equipment	Offset printing machine	
Tools	Tommy bar, Spanner set, Micro meter	
PPE	Proper dress code, Safety gloves, safety shoes	
Materials	Calibrated sheets/offset paper sheet	
Key Point	Packing sheet should be flat.	
Learning Outcome:	Learner will be able to perform plate cylinder packing according to OEM	
Precautions:	Special care must be taken when tightening the plate firmly around the plate cylinder.	
	Excessive tension on the plate may crack the plate at the clamps	

Instructions	**Illustrations**
1. Arrange fresh packing sheets	

2. Perform measurement of packing sheet with micro meter as per OEM	
3. Insert packing sheet in plate cylinder 4. Mount plate on plate cylinder. Ensure smooth surface of plate after inching.	

Learning Unit 3-8:

Perform Paper Run

Overview:

The learning unit ‘perform paper run’ is compressing of knowledge and skills required for verification of smooth travelling of substrate from feeder till delivery section and registration of job as per OEM.

It elaborates importance of registration as well.

> Do you know?
>
> Quality in printing cannot be achieved without perfect registration.

Verification of Registration:

Following are the ways by which we can verify Registration:

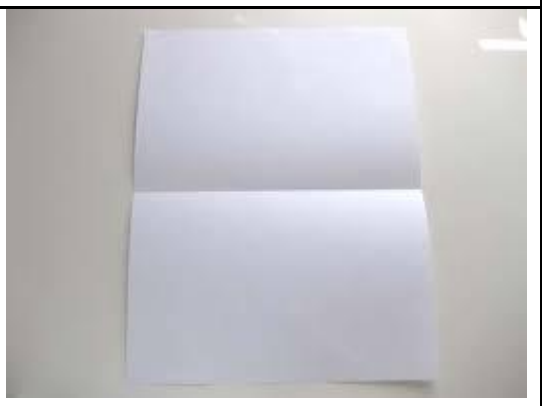
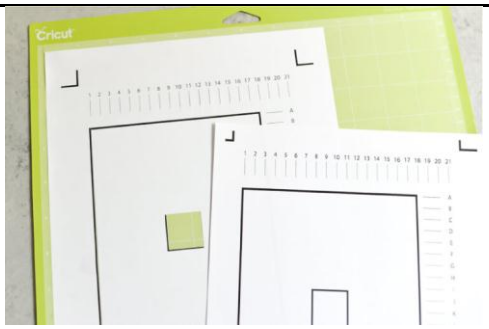
1) Fold the paper from the center to verify center mark
2) Observe all the marks on the edges of the paper to assure perfect registration
3) Verify the margin with requirement of post-production activities
4) Reprint the printed sheets to assure if there is no issue of double printing or doubling.

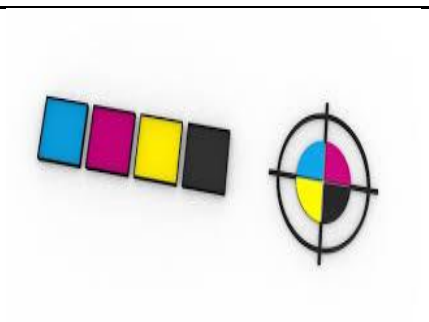
Importance of Registration:

Registration is the most important step of printing, whenever a job is printed in multi colors, the person who is operating the machine has to verify if all the marks are on the right place. In case if the registration is not optimal it can cause issues in post-production activities.
Quality in printing can only be achieved with perfect registration.

Practical Activity:

Module C:	**Make ready print**	
	Learning Unit: 3-8	Perform Paper Run.
	Practical Description:	Registration is the key to quality print.
Time:	1 hour	
Equipment	Offset Printing machine	
Tools	Magnifying/ Eye glass	
PPE	Proper dress, safety shoes, safety gloves	
Materials	Substrate	
Key Point	Observe all the marks on the edges of the substrate to assure perfect registration	
Learning Outcome:	Learner will be able to achieve perfect registration.	
Precautions:	After adjustment none of the machine part be left loose/ unlocked.	

Instructions	**Illustrations**
1. Fold the substrate from the center to verify center mark	
2. Observe all the marks on the edges of the substrate to assure perfect registration 3. Verify if the front marks/margin is equal or it will cause issues in post-production activities.	

4. Reprint the printed sheets to assure image placement is correct.	
5. Reprint the printed sheets to assure if there is no issue of double printing or doubling.	

Summary of the Module:

- A make ready is simply the time required for set up the press to do printing job.
- To perform machine feed, the learner must be able to match the sides of substrate with a quick examination.
- Plate punching system is used to save a lot of time in proper registration of colors. Also without punching the plates cannot be mounted on the plate. During mounting of plate, ready packing of the sheet is to be inserted between the cylinder body and plate.
- There are 2 types of packing sheet; branded calibrated packing sheets and unbranded non calibrated packing sheets.
- For bending, plate should be placed face-side up. And the endlay should be bent at an angle of $90^{o.}$
- The purpose of sidelay in the printing machine is to keep a perfect registration of the substrate from the pin side. Before adjust the sidelay in printing machine, load the substrate, adjust height of pile, and adjust sucker and air stream.
- The purpose of headlay in the printing machine is to keep a perfect registration of the substrate from the front/headlay side. Headlay adjustment is important to keep the substrate to travel straight inside the printing unit from feeding section during printing process.
- It is very important to adjust feeder of machine correctly, otherwise substrate will not be transferred to printing unit and machine or its parts can be damaged.
- Air vacuum adjustment in delivery system is done for perfect pile of substrate in the delivery. High speed production would be impossible without air vacuum adjustment.
- If the side joggers are not adjusted correctly, then the pile will be inaccurate and the edge of the substrate can be wavy
- Observe all the marks on the edges of the substrate for perfect registration because Quality in printing can only be achieved with perfect registration. Registration must be ensured by reprinting of the same few printed sheets.

Frequently Asked Questions
(FAQs)

Question	Answer
1. What is make ready?	A make ready is the set up the press to do a printing job.
2. After loading the substrate on the pile-table, what should we do?	We should adjust the height of the pile table as per feeder of the machine
3. After adjusting height of the pile table, what should we do?	We should make sure that the sucker are set according to substrate size
4. Plate punching machine is used for?	It is primarily used for registration purpose.
5. For which purpose, plate bender is used?	A plate bender is used to bend the end lay of the plate.
6. How should be sidelay adjusted?	Adjustment of sidelay pin is made according to the required range as per standard instruction
7. What must be ensured by printing the same printed sheets?	Registration must be ensured by reprinting of the same printed sheets.
8. Which condition of substrate is not suitable for printing?	Wavy or damaged substrate is not suitable for printing.
9. What is the purpose of headlay?	The purpose of headlay in the printing machine is to deliver the substrate straight to the printing unit.

Self-Assessment

(MCQs)

Please mark the correct one from the given options. You can check your answer with the Answer Key at the end of this module

Q 1. When using one side coated substrate, the other is---------

a. uncoated
b. glow
c. shrink
d. expand

Q 2. In feeding paper, the first step is to _____

a. feed paper
b. setting pins
c. Lower the pile table position
d. No idea

Q 3. Make sure that the pile of substrate is aligned with the _____ the pile-table

a. Left of
b. Right of
c. Center of
d. Bottom of

Q 4. This learning unit is concern with preparation of substrate as per _____

a. Docket or job order.
b. Air sucker pins
c. Handle
d. Scale set

Q 5. Adjust the height of the pile table as per _____ of the machine

a. Damping roller
b. Feeder of machine
c. Plate roller
d. Blanket roller

Q 6. The plate is examined for damage or other faults through_____ confirmation

a. Visual
b. Hidden
c. View
d. Encrypt

Q 7. The clamp bar is tightened from the help of _____.

a. Spanner
b. Screw driver
c. L-Key
d. Scrapper

Q 8. Lock lever is to be pushed which is present in the _____ so that it holds the plate, and tightens the plate.

a. Lever
b. Plate Clamp
c. Side lay
d. Head lay

Q 9. Machine is inched slowly so that _____of the plate reaches the trailing edge of the clamp bar in the plate cylinder.

a. The heading edge
b. The downward edge
c. The trailing edge
d. The side lay

Q 10. Mark the term -------- to prepare printing machine for a new job.

a. Fountain
b. Make ready
c. Inching
d. Registration

Q 11. As used on a printing press, what is a blanket?

a. The large sheet used to cover it at night to keep it clean.
b. A full coating of ink.
c. A rubber sheet that transfers ink to the paper.
d. The mat beneath the press to reduce static discharges.

Q 12. 148 x 210 mm or 5.8 x 8.3 inch is the paper commonly called:

a. A3
b. A5
c. A4
d. A6

Q 13. When printing job starts on offset machine, it goes through a process called:

a. Prepress
b. Post press
c. Initialization
d. make-ready

Q 14. Plate punching is used to obtain accurate:

a. Inking
b. L*a*b*
c. Inching
d. Registration

Q 15. Which side of the plate is called Headlay (Frontlay) side?

a. Front
b. Right side
c. Left side
d. Bottom

Answer Key

MCQ No.	Correct Answer
1.	a
2.	c
3.	c
4.	a
5.	b
6.	a
7.	a
8.	a
9.	c
10.	b
11.	c
12.	b
13.	d
14.	d
15.	d

OFFSET PRINTING MACHINE OPERATOR

Learner Guide

National Vocational Certificate Level 2

Version 1 - September 2018

Module-D

Module D: - Perform print run

Learning Outcomes:

After completion of this learning unit the learner will be able to do:

- Verify print quality on sheet within given intervals,
- Monitor ink duct with in recommended intervals to keep the print quality sustain,
- Maintain water level as per machine standard,
- Verify water temperature of chillers as per standard,
- Maintain pH value of water as per sops,
- Maintain conductivity value of water as per sops,
- Maintain IPA percentage of water as per sops,
- Verify dampening rollers for normal operations.
- Perform blanket adjustment as per machine requirement.
- Control water volume during print run for normal printing
- Maintain registration of printed sheets with in recommended intervals,
- Maintain sidelay marks with in recommended intervals,
- Maintain headlay marks with in recommended intervals.
- Match L*a*b* values as per specimen,
- Maintain ink density as per job requirements.

Learning unit 4-1:

Maintain balance between ink & water

Overview:

This learning unit covers the underpinning knowledge & skills required to verify print quality on sheet within the given intervals, monitor ink duct to keep the print quality sustainable, maintain water level & water temperature of chiller as per standard, maintain pH value of water conductivity, level of water & pH percentage of water as per SOPs. It also verifies normal operation of dampening rollers.

Enlist the checking parameters:

- Water level of chiller/tank shall be noted.
- Chiller temperature should be noted after every two hours
- Ink duct should be monitor within the recommended intervals
- Normal operations of dampening rollers shall be verified

pH value:

The recommended pH value is in between 4.5 to 5.5

Water pH level:

pH stands for power of hydrogen or **potential of hydrogen**. It is a numerical value assigned to a solution that tells us how acidic or basic that solution is. So we can say pH is a measurement of the hydrogen ion concentration. The pH scale ranges from 0 to 14; a pH that is a perfect 7 is said to be neutral and is neither acidic nor basic. A pH less than 7 is said to be acidic and solutions with a pH greater than 7 are basic or alkaline as mentioned below:

It will do to determine the H^+ ions since the ratio of hydroxide ions is constant.

$$[H^+] \times [OH] = \text{constant}$$

1 2 3 4 5 6 7 8 9 10 11 12 13 14

strongest acid — acidic — **neutral** — alkaline — strongest base

Practical Activity:

Module: D	**Perform print run**	
	Learning Unit: 4-1	Maintain balance between ink and water
	Practical Description:	Maintain pH value of water as per SOPs
Time:	**30 min**	
Equipment	Offset printing machine	
Tools	pH meter,	
PPE	Proper dress code, Safety gloves, Safety gloves	
Materials	Water	
Key Point	Check pH value of water	
Learning Outcome:	Learner will be able to maintain pH value of required	
Precautions:	Avoid measuring pH value of water during machine run.	
	Carefully handle the meter in beaker	

Instructions	**Illustrations**
1. Collect the required material/equipment	

2. Collect sample of water from machine tank in a beaker	
3. Dip the pH meter in the beaker up to the desired mark	
4. Record the reading	

Conductivity

Conductivity is the ability of a substance to conduct electricity. Pure water is a very poor conductor of electricity. As material dissolve in water they form ions, which conduct electricity, conductivity co relates with pH because an increase in the number of ions concentration (pH begin a measure of hydrogen ions) also results in increase in the conductivity. Some particular ionized material, like Arabic gum, alcohol will reduce conductivity. Fountain solution will increase conductivity. This means that the highest the range of pH ions in water the highest the conductivity of the water.

Fountain solution and its usage

Fountain or dampening solutions in offset printing technology are used to protect non-imaging areas of the printing plate from wetting with ink. Non-imaging areas of the printing plate are formed by aluminum substrates mostly surface treated to enhance their wet ability.

IPA and its usage

IPA Stands for Isopropyl alcohol. The role of IPA is to reduce the surface tension of water and increase the viscosity. It ensures lower roller temperature through evaporation. IPA ensures easy and smooth flow of the minimum amount of water on maximum area of plate uniformly.

Dampening roller setting

In offset printing, the system that transfers a water-based fountain solution to the printing plate as a means of making non-image areas ink repellent is dampening roller. Offset is based on the principle that oil and water do not mix readily, thus the water-based fountain solution ensures that the oil-based ink does not collect in undesirable regions of the printing plate. It moistens the non-image areas of the offset plate so that they will not accept ink from the ink form rollers.

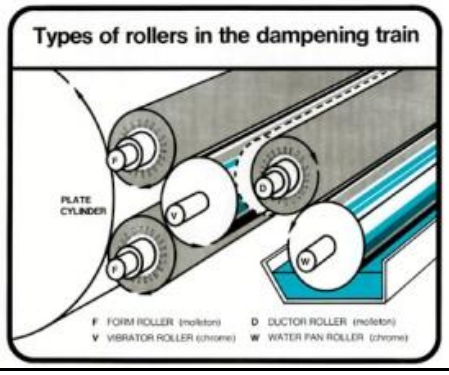
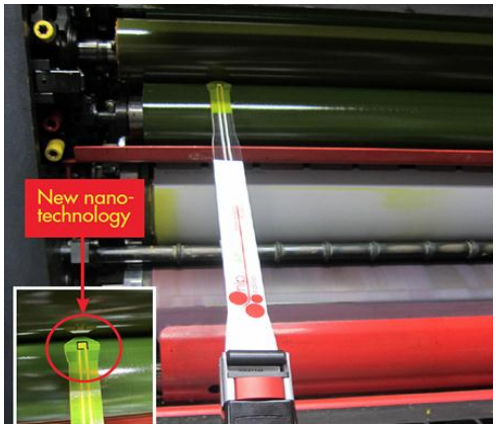
The following procedure is followed for setting of dampening roller.

1. Mount plate on plate cylinder with required packing standard.
2. Install first dampening roller
3. Arrange 2 film strips 2” inch wide and 24” inch long.
4. Insert both the strips between plate and font rollers 2” inch away from corners.
5. activate dampening system by lever
6. Check and ensure the pressure by pulling the strip smoothly.
7. Follow the same process between font rollers and vibrator roller.
8. Adopt the same procedure with the second font roller.
9. Follow the same procedure for setting of the ductor roller with vibrator roller and water fountain roller.

Practical Activity:

Module: D	**Perform print run**	
	Learning Unit: 4-1	Maintain balance between ink and water
	Practical Description:	Perform Dampening roller setting
Time:	**30 min**	
Equipment	Offset printing machine	
Tools	Spanner, Allen key	
PPE	Proper dress code, safety shoes, safety gloves	
Materials		
Key Point	Setting of fountain (dampening) rollers must be adjusted smoothly	
Learning Outcome:	Learner will be able to perform dampening rollers setting	
Precautions:	Avoid over tightening of dampening rollers.	

Instructions	**Illustrations**
1. Mount plate on plate cylinder with required packing standard.	

2. Install first dampening roller. Arrange 2 film strips 2” inch wide and 24” inch long. 3. Insert both the strips between plate and font rollers 2” inch away from corners.	
4. Activate dampening system by lever	
5. Check the pressure by pulling the strip. 6. Ensure smooth function of the strip. 7. Follow the same process between font rollers and vibrator roller.	
8. Adopt the same procedure with the second font roller.	
	

9. Follow the same procedure for setting of the ductor roller with vibrator roller and water fountain roller.	

Ink density & its importance

Density, or reflective density to be more accurate, is a measure of the percentage of reflected light. In printing this usually means the percentage of light that is reflected from the paper and the ink. It is a convenient metric to use in a print production environment, since it provides insight through a one-dimensional variable by which press operators can judge whether too much or not enough ink is being laid on the paper.

It is one variable of many used for controlling color on press.

Optical density is a kind of measurement value, applicable to Transmissive samples (films) and reflective samples (printed matters). The function of the Transmissive densitometer is to measure the amount of light transmitting to a sample, while the reflective one is to measure the amount of light reflected by the sample.

A layer of printing ink can absorb the light; the thicker the ink films is the more light will be absorbed, and the printed matter will appear darker

Learning unit 4-2:

Manage Dot gain

Overview:

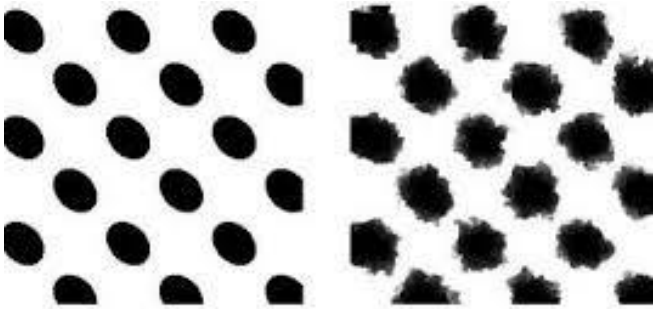
This learning unit covers the knowledge and skills required to manage Dot gain through adjustment of blanket as per machine requirement and control water volume during print run for desired printing. It also describes the effects of Dot gain in printing and factors responsible for Dot gain.

Dot gain

Dot gain is a phenomenon that causes printed material to look darker than intended. This happens because the diameter of halftone dots increases during the prepress and printing process. Prepress and press operators can try to minimize certain types of dot gain but cannot avoid that dot gain occurs.

Effects of Dot gain

Dot gain can be controlled effectively but cannot be avoided entirely. It should be kept in mind that dot gain is a measurable, predictable and controllable effect in any of the printing process for effecting quality printing output. When the dot grows in size during the pre-press/press operations (i.e. from the preparation of image carrier to the final printing) basically due to some of the unavoidable situations during the successive stages of print production, it is termed as the dot gain.
As such it is also the responsibility of the designer to be aware of dot gain and to anticipate its effect. Dot gain is not identical for all the colors used in color printing. There are slight differences in dot gain between cyan, magenta, yellow and black. Prepress operators are expected to make sure that plates delivered to the press are linear, with a typical tolerance of around 2%



An image that has not been adjusted to account for dot gain will appear too dark when printed and obscure details

Factors responsible for Dot gain:

Total dot gain can be defined as the difference between the dot size on the image carrier/plate and the corresponding printed dot size on the printed substrate. Surface characteristics of paper and ink absorption rates on the surface of the substrate are the basic factors which lead to accelerate the process of dot gain. Dot gain is caused by ink spreading around halftone dots.
Several factors can contribute to the increase in halftone dot area

Ink. The ink itself plays the single most influential role in controlling dot gain. Properties such as viscosity and tack are a good start. As printing pressure can squeeze the ink out of its dot shape causing gain, ink viscosity is a contributing factor with coated papers; higher viscosity inks can resist the pressure better.

Pressure. In the conventional sheet fed offset presses, the squeeze pressure between the printing cylinders may also help the dot size to grow. Blanket to blanket, plate to blanket and form roller to plate all are play a role to increase dot gain.

Blankets. When the blankets get old, dot gains will go a little sketchy. Sometimes all you have to do is change the blanket for the problem to get the better result. Also, the more piling on the blanket, the dots become sharper.

Paper. Glossy or matte, you will get different dot gain settings based on how the print lays down. While comparing the surface of the coated paper and uncoated paper, uncoated papers show higher dot gain, because of its surface roughness and porosity.

Machine. In this instance, it's not only the condition of the bearers that make a difference which could be wearing or causing slur. The conditions of all the bearings, gears and rollers come into play.

Ink and water balance. Some put this factor much higher, but it shouldn't play such a large factor if you are in the proper ink and water balance window.

Plate making. If the plate is scrubbed properly it can make a difference. Additionally, the type of dots used can make a difference. For example, we recently went to an elliptical dot. This meant about a two percent increase in dot gain.

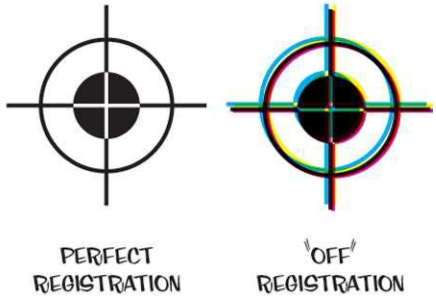
Learning unit 4-3:

Maintain Registration

Overview:

It defines registration, elaborate purpose of sidelay and headlay marks and necessity of magnifying glass in registration process.

What is registration?



Registration is the most important step of printing, whenever a job is printed multi colors, the person who is operating the machine has to verify if all the marks are on the right place. In case if the registration is not optimal it can cause doubling on print image.

Quality in printing can only be achieved with perfect registration.

Purpose of sidelay & headlay marks:

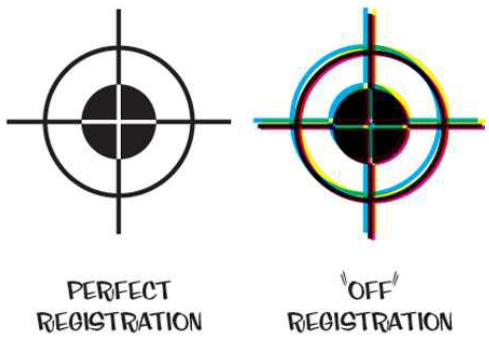
The purpose of side lay in the printing machine is to keep a perfect registration of the substrate from the pin side.

The purpose of head lay in the printing machine is to keep a perfect registration of the substrate from the front lay side.

Necessity of magnifying glass in registration process:

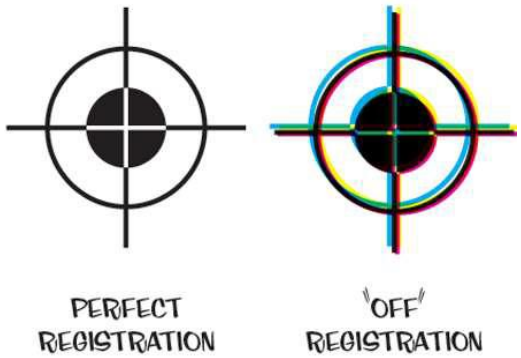
It is used to verify registration precisely as well as doubling, slurring and sidelay marks. The printer checks the registration marks, using the magnifying /eye glass to make sure the plates are accurately aligned.

Without registration, your images can appear blurred.



Practical Activity:

Module: D	**Perform print run**	
	Learning Unit: 4-3	Maintain registration
	Practical Description:	Maintain registration of printed sheets within recommended intervals.
Time:	**1 hours**	
Equipment	Offset printing machine	
Tools	Magnifying/Eye glass, spanner	
PPE	Proper dress code, safety gloves, safety shoes	
Materials	Substrate, Offset ink.	
Key Point	Quality in printing can only be achieved with perfect registration.	
Learning Outcome:	Maintain Registration and Verify sidelay & headlay marks	
Precautions:	Without verifying the registration the quality of the job will be effected	

Instructions	**Illustrations**
Whenever a job is printed in multi colors, the person who is operating the machine, has to verify if all the marks are on the right place. In case if the registration is not optimal it can cause doubling on print image.	

Learning unit 4-4:

Control Delta E values/variation

Overview:

Delta E (ΔE) is a great tool to help us communicate color difference and customer expectations.

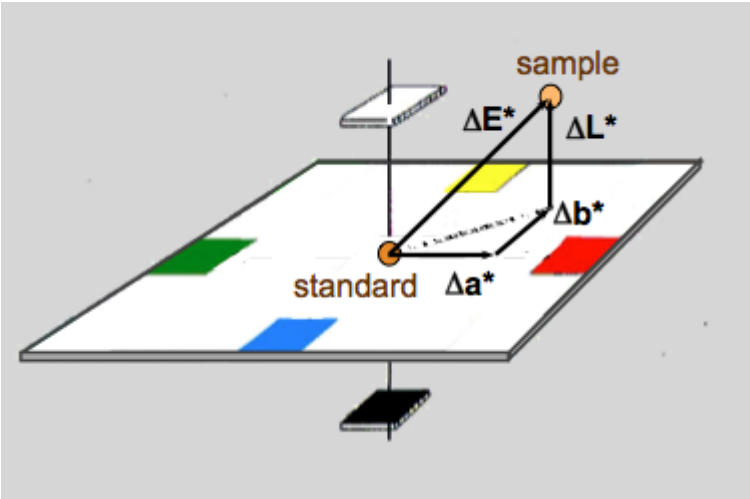
The learner will be able to describe ΔE, L*a*b* values and importance to maintain L*a*b* values.

Delta E:

Delta-E (ΔE) is a single number that represents the 'difference' between two colors.

The lower the Delta E, the closer the colors are to each other. A Delta E of zero indicates that there is zero difference between the two colors.

The higher the Delta E, the further apart the colors are and more color difference is perceived.



L*a*b* values:

A uniform color space in which colors are located within a three dimensional rectangular coordinate system. The three dimensions are lightness (L*), redness/ greenness (a*) and yellowness/blueness (b*). CIE Lab is a part of the current CIE recommendations and also known as L*a*b*.

Spectrophotometer:

Spectrophotometers are color measurement devices used to capture and evaluate color.

Spectrophotometers can measure just about anything, including liquids, plastics, paper, metal and fabrics, and help ensure that color remains consistent from conception to delivery.

Importance of maintaining L*a*b* values during production:

L*a*b* is a color space defined by International Commission on Illumination. L*a*b* values are used to standardize color values in a mathematical manner so that any device or person can perceive the same color as required by the job.
All the colors are created from four basic process colors CMYK (Cyan, Magenta, Yellow and Black). L*a*b* values represent a 3-dimensional graph (x, y, z axis) or a color space gamut where L* is on Z-axis. In another words the central vertical axis which represents lightness values, the value range is from 0 (black) to 100 (white). The lower the value of color, the darker it gets (e.g. 15 L* means Black) and higher the value of the color, lighter the color gets (75 L*).

Summary of the module:

- pH stands for power of hydrogen or potential of hydrogen. It is a numerical value that tells us how acidic or basic the solution is. The pH scale ranges from 0 to 14; a pH that is a perfect 7 is said to be neutral and is neither acidic nor basic. A pH less than 7 is said to be acidic and solutions with a pH greater than 7 are basic or alkaline. In offset Printing the recommended pH value is in between 4.5 to 5.5 worldwide.
- Fountain or dampening solutions in offset printing technology are used to protect non-imaging areas of the printing plate from wetting with ink.
- IPA Stands for Isopropyl alcohol. The role of IPA is to reduce the surface tension of water and increase the viscosity.
- Ink density is the percentage of light that is reflected from the paper and the ink.
- Dampening rollers are transfer a water-based fountain solution to the printing plate. During setting of these rollers, the learner must avoid over tightening of them and adjust them smoothly.
- Dot gain is a phenomenon that causes printed material to look darker than intended. This happens because the diameter of halftone dots increases during the prepress and printing process. The dot grows in size during the pre-press/press operations basically due to some of the unavoidable situations which must be considered to avoid dot gain.
- Registration is the most important step of printing, whenever a job is printed multi colors, the person who is operating the machine has to verify if all the marks are on the right place. In case if the registration is not optimal it can cause doubling on print image. Quality in printing can only be achieved with perfect registration.
- The purpose of sidelay in the printing machine is to keep a perfect registration of the substrate from the pin side.
- The purpose of headlay in the printing machine is to deliver substrate straight to the printing unit.
- Magnifying glass is used to verify registration marks precisely.
- Delta-E (ΔE) is a single number that represents the 'difference' between two colors.
- The lower the Delta E, the closer the colors are to each other.
- L*a*b* value is a uniform color space in which colors are located within a three dimensional rectangular coordinate system. “L” is the lightness, whereas “a” (green / red) and 'b' (blue / yellow). L*a*b* values are used to standardize color values in a mathematical manner so that any device or person can perceive the same color as required by the job.

Frequently Asked Questions
(FAQs)

Question	Answer
1. What pH stands for?	pH stands for power of hydrogen or potential of hydrogen.
2. What is the recommended pH value in offset Printing?	In offset Printing, the recommended pH value is in between 4.5 to 5.5.
3. Why Fountain solutions is used in offset printing?	Fountain solutions is used to protect non-imaging areas of the printing plate from wetting with ink
4. Does IPA – Isopropyl Alcohol have an impact on the viscosity??	IPA is the only liquid which both reduces the surface tension and increases the viscosity.
5. What is the effect of wrong registration?	If the registration is not optimal it can cause doubling on print image.
6. For which purpose, spectrophotometers are used?	Spectrophotometers are color measurement devices used to capture and evaluate color.
7. What must be ensured by reprinting the same printed sheets?	Registration must be ensured by reprinting the same printed sheets.
8. Which are the basic process colors?	The four basic process colors are CMYK (Cyan, Magenta, Yellow and Black).
9. How dot gain caused?	Dot gain is caused by ink spreading around halftone dots.
10. By which method the dampening rollers are set?	Film strip method.

11. Which is used to prepare the film strips?	Packing sheet is cut and used as the film strips
12. What are the types of dampening system?	Conventional and alcohol dampening system.

Self-Assessment
MCQs

Mark the correct one from the given options. You can check your answer with the Answer Key at the end of this module.

Q 1. Which of the following is NOT used for color matching?

a. Color proof
b. pH meter
c. Color measuring devices
d. Shade cards

Q 2. Which of the following is the most important check for printing registration?

a. Registration mark
b. Color bars
c. Paper GSM
d. Paper type

Q 3. If ink density is not maintained, what effects we will see in printing?

a. Scumming
b. Color variation
c. Set-off problem
d. All of the above

Q 4. Smudging is cause of:

a. dot gain
b. high printing speed
c. Ink roller problem
d. Paper problem

Q 5. Reason for dot gain during printing is:

a. blanket setting
b. Ink roller setting.
c. Damping roller setting
d. All of the above

Q 6. Proper placement of all colors of the picture is known as:

a. Scumming
b. ink color sequence
c. Registration
d. damping

Q 7. Job Positioning on substrate is determined by:

a. headlay and sidelay marks
b. back lay marks
c. color bars
d. paper side Trimming

Q 8. Which tool is used for checking of registration?

a. Densitometer
b. pH meter
c. Magnifying glass

d. Conductivity meter

Q 9. Which of the following is used to define colors?

a. pH value
b. L*a*b* Values
c. Magnifying glass
d. Conductivity meter

Answer Key

MCQ No.	Correct Answer
1	b
2	a
3	d
4	a
5	d
6	c
7	a
8	c
9	b

Module E: - Perform post production activities

Learning Outcomes:

After completion of this module the learner will be able to do:

- Remove ink residual from machine rollers as per SOP
- Wash machine rollers as per SOP.
- Remove printing plates from machine as per SOP,
- Clean all printing plate with proper plate cleaner
- Perform blanket wash as per SOP
- Verify printing blankets for any damage as per SOP
- Verify impression cylinder for residual ink,
- Perform impression cylinder wash as per SOP.
- Perform dampening roller wash as per SOP,
- Perform cleaning of ink duct/knives

Learning unit 5-1:

Perform ink rollers cleaning

Overview:

This learning unit describes the procedure and importance of ink roller cleaning as well as ink knife cleaning.

Inking System:

The basic function of inking system of the Offset printing machine is to transfer the ink from the ink fountain/duct to the plate.

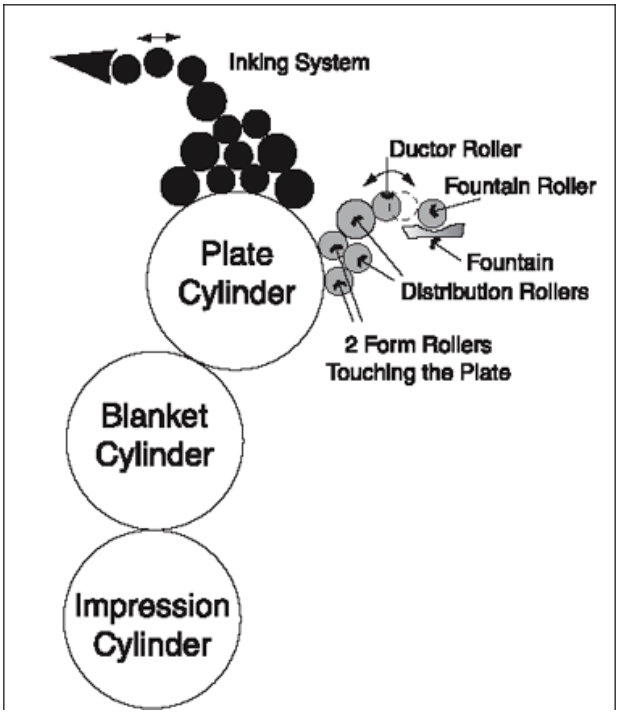
The inking system of Offset presses consists of following parts:

• **Ink Fountain/Duct**- A pan that contains ink supply.

• **Ductor roller**- A transfer roller that alternately contacts the ink fountain roller and the first roller of the inking system, called ductor roller.

• **Oscillator or Vibrators**- Gear or chain driven rollers that rotate and oscillate from side to side, distributing and smoothening out the ink film.

• **Distribution rollers** - These are gravity driven rollers which are always in contact with two rollers.



Rider rollers - These rollers are always in contact with single roller.

• **Form rollers**- A series of three to four rollers, usually of different diameters, that contact the printing plate and transfer ink to it.

Importance of ink roller cleaning:

The inking unit comprises of a series of rollers that apply a metered film of ink to a printing plate. Primarily made of synthetic rubber, it is a complex mix of natural rubber and various chemicals that obtain their stability and elasticity through the vulcanization process. Vulcanization is the process of hardening rubber with chemicals but it is the raw rubber that gives the ink roller its basic characteristics. The hardness of a roller also known as, shore hardness of a roller designates the resistance against penetration of a needle measured by the degree at which the penetration occurs, the higher the better.

While dampening rollers should be water-friendly, inking rollers must be adjusted to be emulsified (oil-friendly). In an inking system with conventional inks, rollers of Shore A hardness between 30° and 35° are used.

For UV inks, rollers with Shore A hardness of 25° and between 40° and 45° are used. For alcohol dampening systems, Shore A hardness of between 25° and 30° is suitable. In direct dampening systems, hard rubber rollers are used.

Methods to optimize life span of ink rollers:

Ink rollers are a long-running parts, it is mostly damaged by three main factors:

- High temperature due to long-run use and friction between rollers.
- Abrasive particles in ink or fount solution.
- Using wrong cleaning agents which expose roller grain.

In the course of time components of paper and ink will deposit on the rollers which can cause considerable trouble in the printing process. Especially calcium carbonate will considerably influence the emulation behavior and ink transport. Special cleaning solutions adjusted to this task will be able to remove residues of this kind and fill the grains on rollers.

To optimize ink roller lifespan, the following steps may be taken:

- Timely cleaning
- Visual inspection of ink rollers during cleaning for open pores or cuts
- Timely rotation to avoid denting
- Using the correct cleaning agents

Methods of riskless cleaning:

For efficient ink roller cleaning, the following steps should be taken:

1. The ink remaining in the duct is taken carefully from the ink duct.
2. Then the metal blade and duct rollers are cleaned by using cleaning agents using a wash cloth.
3. It should be made contact with the oscillator.
4. Then the ink wash up device is taken and it is inserted in the provisions present near to the distributor roller.

5. Then the wash up device is tightened.
6. Now the machine is started for running.
7. During running the machine and when the rollers are rotating, the cleaning agent is poured over the roller surface.
8. Due to the contact of all inking rollers with one another the cleaning agent is transferred to all roller surfaces and the ink gets cleaned and the ink and solvent particles are finally collected in the wash up device.
9. After cleaning the rollers the wash up device is also cleaned to make it free from the waste collected material.

Practical Activity:

Module E:	Perform post-production activities

	Learning Unit: 5-1	Perform ink roller cleaning
	Practical Description:	Clean ink rollers in a conventional dampening offset machine
Time:	**30 min**	
Equipment	Offset printing machine	
Tools	Cleaning knife, scrapper	
PPE	Proper dress code, safety shoes, Rubber gloves	
Materials	Roller wash/Kerosene oil	
Key Point	Using proper cleaning agent is eminent; kerosene oil can reduce the life of rollers as well as printing machine.	
Learning Outcome:	The learner will be able to clean ink rollers in offset printing machine	
Precautions:	Use rubber gloves to avoid chemical contact	

Instructions	Illustrations
1.Take the ink remaining in the duct carefully from the ink duct.	
2. Clean the metal blade and duct rollers by using cleaning agents and wash cloth. During this time the ducter roller must be fully out of contact from the duct roller. It should be made contact with the oscillator.	

3. Insert the ink wash up device in the provision present near to the distributor roller.	
4. Tight the wash up device smoothly	
5. Start the machine for running, and pour the cleaning agent over the roller surface.	

Note: Due to the contact of all inking rollers with one another, the cleaning agent is transferred to all roller surfaces. Now the ink gets cleaned and solvent particles are finally collected in the wash up device.	
6. Clean the wash up device to make it free from the waste collected material.	

Learning unit 5-2:

Wash printing plates

Over view:

Washing the printing plates is the procedure in which plates are removed from the machine cylinder with special tools called spanner set, Tommy set. After that printing plate is removed from the machine and cleaned from the plate cleaner for re-use if the same job has to run again and also for the better quality printing. Using good quality chemicals for cleaning the plates is very important for the life of printing plates.

Importance of plate cleaning process:

Plate cleaning is a very important process in offset printing. Plate cleaning can be done during printing process because of paper dust or any other particles, which produce disturbance in the job. But the machine must be in crawling position. This process is also called conservation plate process.

Application of CTP plate chemicals:

CTP is a short form of (computer to plate). There are many chemicals used before, during and after printing called press room chemicals. There is a chemical called CTP plate cleaner that is used to clean the CTP plate from any residue of ink or oil deposited.

Purpose of washing ink from the conventional plates:

Washing ink from the conventional plate can be for different purposes such as to save the plate for re-use, remove the ink after printing and coat the plate with a special chemical as per SOP that protects the plate.

Practical Activity:

Module: E	**Perform post production activities**	
	Learning Unit: 5-2	Wash Printing Plates
	Practical Description:	Remove printing plates from machine as per SOP.
Time:	**30 Min**	
Equipment	Offset Printing Machine	
Tools	Spanner Set, Tommy Set	
PPE	Proper dress code, safety shoes, safety gloves	
Materials		
Key Point	Follow steps to take out plate from plate cylinder	
Learning Outcome:	Perform the plate cleaning process as per SOP and use the required plate cleaning chemical	
Precautions:		

Instructions	**Illustrations**
2. Follow the method of removing plate	

3. Printing machine must be in the stop position.	
4. Spanner and Tommy must be used to take the plate out.	

Practical Activity:

Module: E	Perform post production activities

	Learning Unit: 5-2	Wash Printing Plates
	Practical Description:	This practical helps to know the benefits of the printing plate wash and to conserve the plates for re-use.
Time:	**30 Min**	
Equipment	Offset Printing Machine	
Tools	Spanner Set, Tommy Set	
PPE	Proper dress code, safety shoes, safety gloves	
Materials	Cleaning Cloth, plate cleaner chemical.	
Key Point	Clean Plate With Clean Cloth	
	Follow steps to take out plate from plate cylinder	
	Cleans plate on the clean surface	
Learning Outcome:		
	Perform the plate cleaning process as per SOP and use the required plate cleaning chemical	
Precautions:		

Instructions	Illustrations
1.Take the plate out of the plate cylinder using the spanner and Tommy set.	
2. Straight the plate by hands with the help of a clean cloth, 3. Clean the plate by using the plate cleaner chemical. 4. Coat the plate with the preserving chemical. **5.** Store the plate for further use	

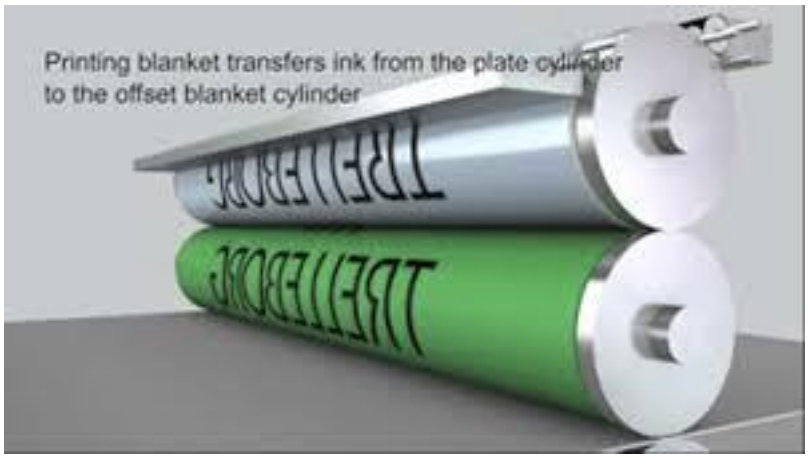
Learning Unit 5-3:

Wash printing blanket

Overview:

This module describes the purpose, importance and procedure of printing blanket cleaning.

Printing Blankets and Blanket cylinder



Printing blanket transfers ink from the plate cylinder to the offset blanket cylinder. The blanket cylinder has reels or bars to which the blanket is attached and pulled tightly over the metal surface of the cylinder. Each end of the cylinder has a metal ring called a bearer, the diameter of which is the actual diameter of the cylinder, and of the gear that drives the cylinder.

Importance of blanket wash:

It is most often used for the purpose of **cleaning** the **blanket** in **offset** sheet-fed **printing**. The **blanket** is a carrier of the image and in times when it's necessary to move the image or make some kind of adjustment it can be of benefit to the operator to **clean** the **blanket** before proceeding.

Procedure of cleaning Blanket

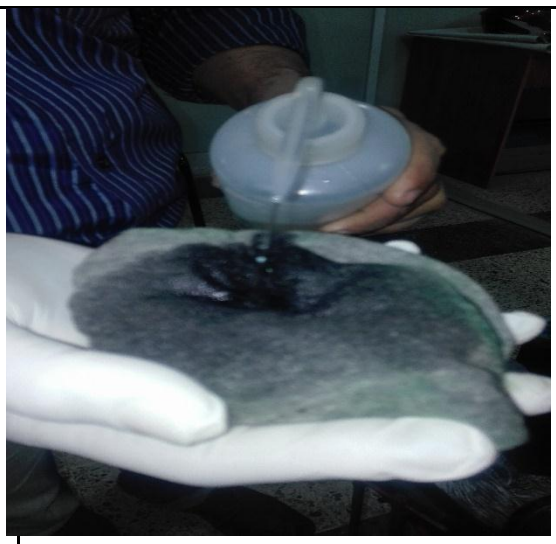
Following are the steps of cleaning blanket

1. Stop the machine and make the machine run in inching/crawling mode
2. Take a cloth and soak it with cleaning agent
3. Cleaning the blanket with this cloth in right to left motion
4. Take a dry clean cloth and wipe the diluted ink
5. Make sure the blanket is dry and completely clean

Practical Activity:

Module E:	**Post Production activities**	
	Learning Unit: 5-3	Wash printing blanket
	Practical Description:	Cleaning Blanket
Time:	**30 min**	
Equipment	Offset press	
Tools	Tommy set	
PPE	Proper dress code, Rubber gloves, Face mask	
Materials	Cleaning agent, Cleaning cloth	
Key Point	Handle the blanket carefully	
Learning Outcome:	Learner will be able to perform blanket wash as per SOP	
Precautions:	Do not touch the chemicals without proper protective equipment	

Instructions	**Illustrations**
1. Stop the machine and make the machine run in inching/crawling mode	

2. Take a cloth and soak it with cleaning agent	
3. Clean the blanket with this cloth in right to left motion	
4. Take a dry clean cloth and wipe the diluted ink 5. Make sure the blanket is dry and completely clean	

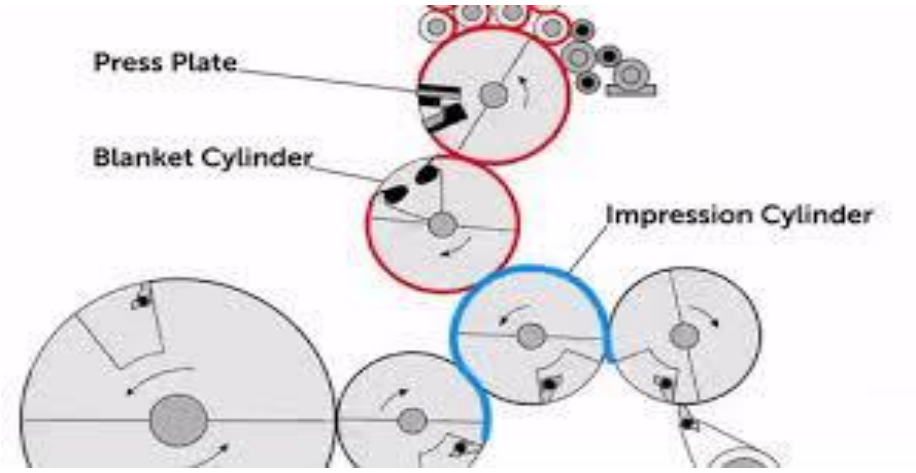
Learning Unit 5-4:

Clean impression cylinder

Overview:

This learning unit describes the importance and procedure of cleaning of impression cylinder.

Impression cylinder



Impression cylinder is a part of an offset printing press which carries the paper or other substrate through the printing unit and beneath the inked press blanket.

The impression cylinder also provides a hard backing which allows the blanket to press a strong, solid impression on the paper. Like the plate cylinder and blanket cylinder, the impression cylinder has a cylinder gap interrupting its circumference, in which is located the gripper, a shaft containing fingers that grasp and hold the incoming sheet of paper and hold it in register under the blanket, before releasing the printed sheet to be sent to the delivery pile.

Unlike the plate and blanket cylinders, the surface of the impression cylinder possesses no undercut, and the true diameter of the cylinder is equal to the diameter of the bearers of the other two cylinders. On the impression cylinder, it is the bearers that are undercut.

Controlling the distance between the impression and blanket cylinder bearers is set in much the same way as that between the plate and blanket cylinders in a non-bearer-contact press. The manufacturer's recommended gap between the bearers of the two cylinders is determined by feeler gauges that are inserted between the bearers on a properly packed press.

In some press configurations, a common impression cylinder is used. A common impression cylinder is an impression cylinder that contacts more than one blanket, passing a single sheet beneath successive blankets, commonly used in multicolor printing.

Procedure of cleaning Impression cylinder:

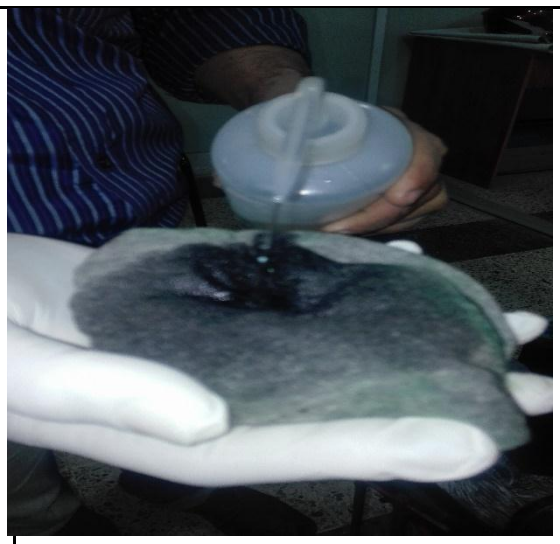
Following are the steps of clearing impression cylinder

1. Stop the machine and make the machine run in inching/crawling mode.
2. Take a cloth and sock it with cleaning chemical,
3. Cleaning the cylinder with this cloth in right to left motion.
4. Take a dry clean cloth and wipe the diluted ink

Practical Activity:

Module E:	**Post Production activities**	
	Learning Unit: 5-4	Clean impression cylinder
	Practical Description:	Perform impression cylinder wash up as per SOP
Time:	**30 min**	
Equipment	Offset printing machine	
Tools		
PPE	Proper dress code, Rubber gloves, Face mask	
Materials	Cleaning agent, Cleaning cloth	
Key Point	Clean the cylinder right to left	
Learning Outcome:	Learner will be able to perform impression cylinder wash as per SOP	
Precautions:	Do not touch the chemicals without proper protective equipment	

Instructions	**Illustrations**
1. Stop the machine and make the machine run in inching mode	

2. Take a cloth and sock it with cleaning agent	
3. Clean the cylinder with this cloth in right to left motion 4. Take a dry clean cloth and wipe the diluted ink 5. Make sure the cylinder is dry and completely clean	

Learning Unit 5-5:

Wash dampening rollers

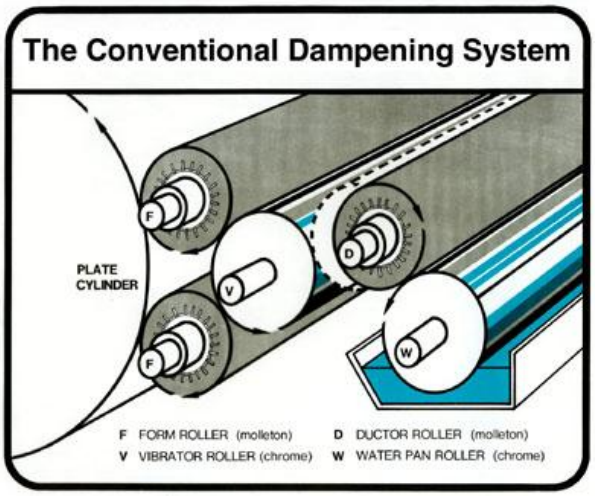
Overview:

This learning unit describes the purpose of dampening rollers in printing machine. It also explains the procedure of impression cylinder cleaning.

Dampening System:

In offset printing, the system that transfers a water-based fountain solution to the printing plate as a means of making non-image areas ink repellent. Offset lithography is based on the principle that oil and water do not mix readily, thus the water-based fountain solution ensures that the oil-based ink does not collect in undesirable regions of the printing plate.

Purpose of the Dampening System:



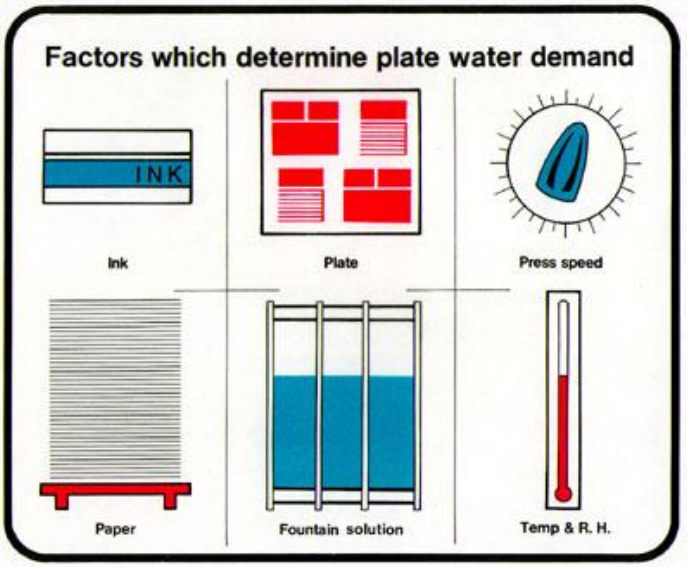
The dampening system, Moisten the non-image areas of the plate so that they will not accept ink from the ink form rollers. A typical configuration is shown on left.

Relative selectivity of image and non-image areas of the plate

The image areas have the ability to attract ink and repel dampening solution. The non-image areas have the ability to attract water and repel ink. Something that attracts water is **hydrophilic**. Something that repels water is **hydrophobic**. Something that attracts ink is **lyophilic**. Something that repels ink is **oleo phobic**.

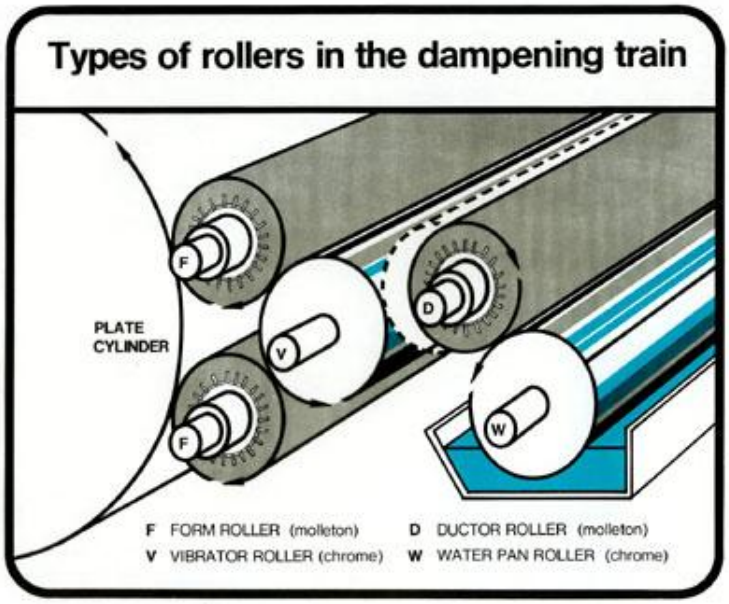
Factors which determine the amount of dampening solution a plate requires

- Ink (more oily ink requires less water)
- Amount of image on the plate (more image results in less water demand)
- Press speed (faster speeds may result in the need for less water--less evaporation time per impression)
- Paper (more absorbent paper requires more water)
- Fountain solution (type of additives in water)
- Temperature (higher pressroom temperature results in faster evaporation leading to more water required)
- Relative humidity (higher humidity retards evaporation leading to less water demand)
- Temperature and relative humidity are the only two of these variables that are not job-specific. Thus, they can be controlled.
- Temperature and relative humidity are controlled through the proper use of air conditioning (actually invented for printing plants)



Types of rollers in the dampening system

- Forms: covered with absorbent paper or cloth called molleton.
- Pan (fountain) roller: aluminum, stainless steel, or chrome plated steel (best)
- Ductor: covered with molleton
- Vibrator: aluminum, stainless steel, or chrome plated steel (best)
- All rollers must be clean--free from ink--to prevent an interruption of water flow (ink is hydrophobic).
- Molleton covers soak up water in much the same way as a bath towel--once they're too wet, it takes a long time from them to dry. **This phenomenon results in the "gets-wet, stays-wet" problem** and causes changes made to the water flow by the press operator to take effect slowly.



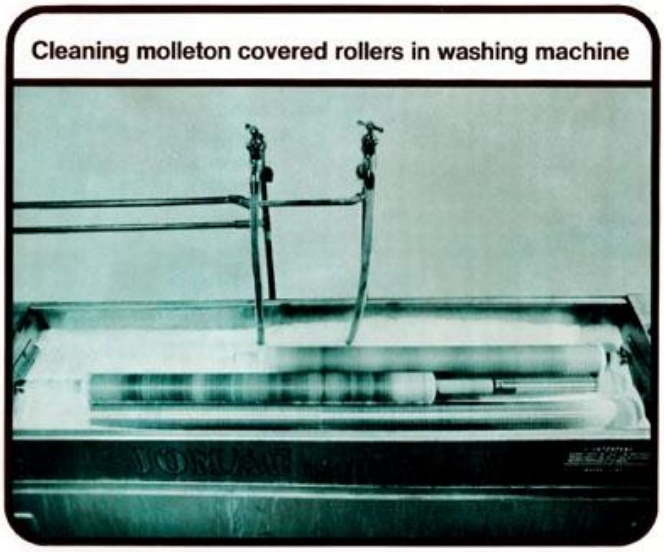
Roller settings

- For accurate water transfer, all rollers must be correctly set.
- The ductor must be correctly aligned to both the vibrator and fountain rollers.
- The forms must be set tight enough to the vibrator so that the gear-driven vibrator will turn the forms without slippage.
- The forms must be set to the plate with only enough pressure to dampen the plate--no more. Excessive pressure causes a "squeegeeing" effect and will cause premature plate wear.

Cleaning Molleton:

All dampening rollers must be clear to prevent an interrupted water flow.

- In fig. you can see a special "washing machine" that is used to clean molleton-covered forms and ductors. A strong soap is used.
- Ink can be removed from molletons, but the fabric will remain stained.



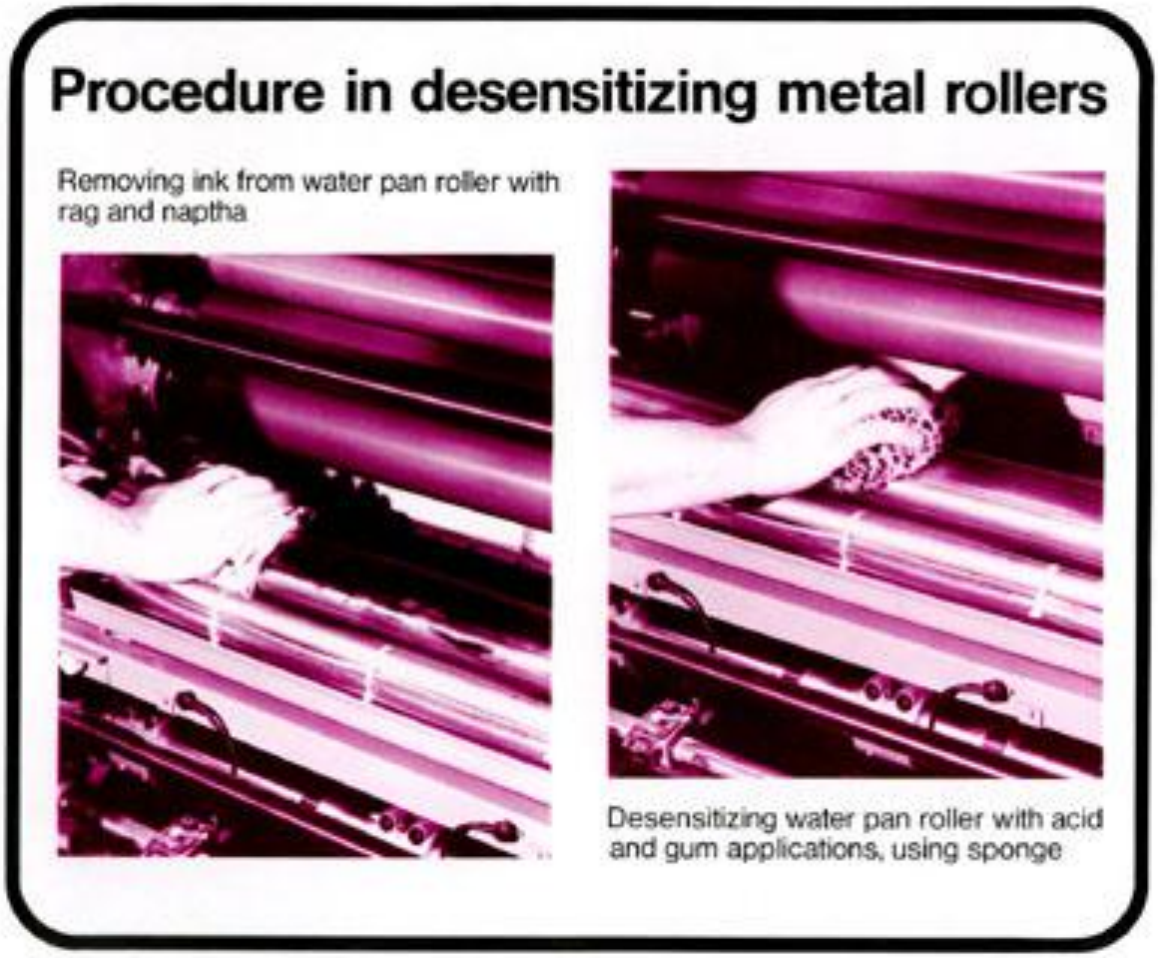
Desensitizing metal rollers in the dampening system

If metal (aluminum, stainless steel, or chrome) dampening rollers become covered with ink, the ink must be removed with solvent (ignore the "naptha" mentioned in the

illustration).

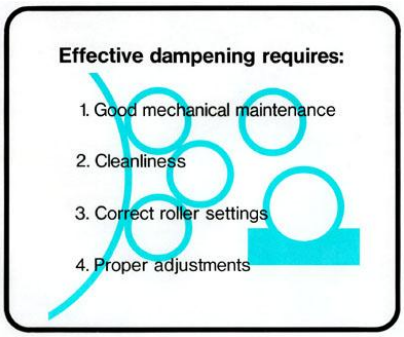
Care must be taken to not allow solvent to soak into molletons.

Aluminum, stainless steel, or chrome rollers must then have a solution of gum Arabic applied to counteract the oily residue of the solvent. Gum Arabic **must always be buffed dry** and never be allowed to dry in streaks.



Effective dampening requires:

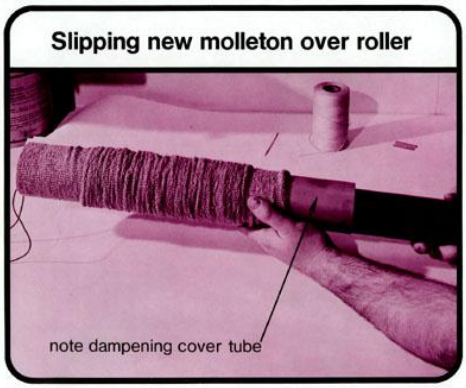
- Good mechanical condition: gears and bearings must be clean and lubricated.
- Cleanliness: ink on the rollers will prevent water flow.
- Correct roller settings: either too high or too low pressures will prevent good water flow.
- Proper adjustment of ductor dwell.



Removing old molleton cover:

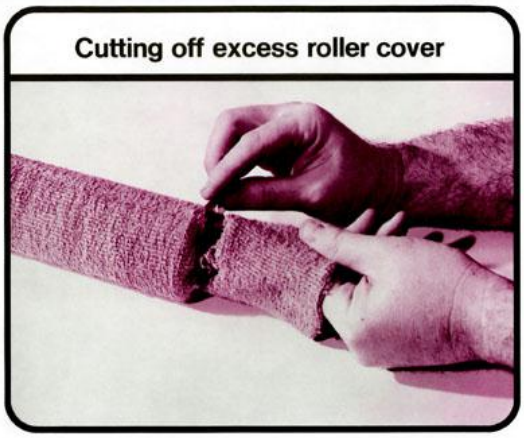
After several washings, molleton-covered rollers become too worn-out to be properly set against the plate. Or, the molleton can become so impregnated with ink that it must be replaced.

Slipping new molleton over roller: New molleton must be the same size as the roller being covered. The roller is tacky (sticky), so the cover won't just slip on. Therefore, a dampening cover tube must be used to slip the cover over the roller.



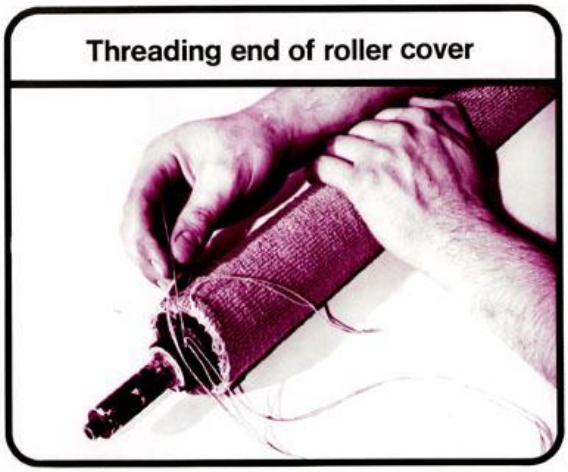
Cutting off excess roller cover:

New molleton can either be purchased prefabricated to fit a given roller or on rolls. Roll material is more versatile than prefabricated covers because you don't need to stock as many sizes. However, roll material must be cut to length as shown.



Threading end of roller cover:

If you purchase rolls of molleton, the cover material must have draw-strings sewn onto the ends of the roller.



Tying roller cover ends:

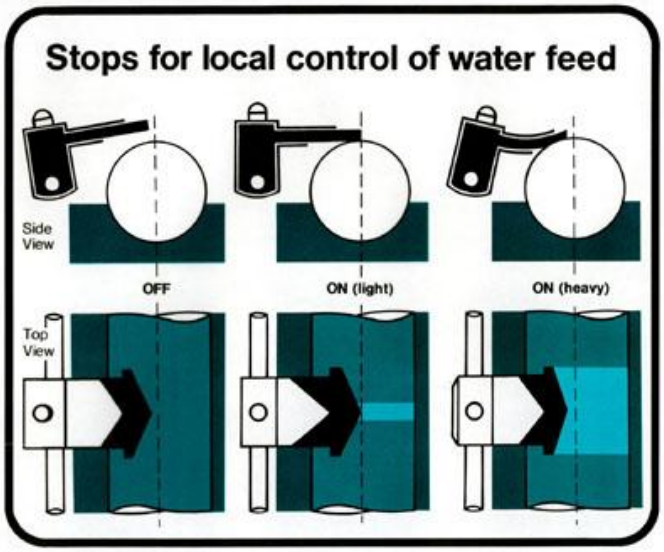
Once the draw-strings are sewn onto the roller, the ends of each draw-string are pulls taut and tied.

Roller covers—other than roll-based molleton are illustrated below. The paper dampening sleeve illustrated at the extreme right can be used on the last-over ink form as a hickie picker.

Water stops:

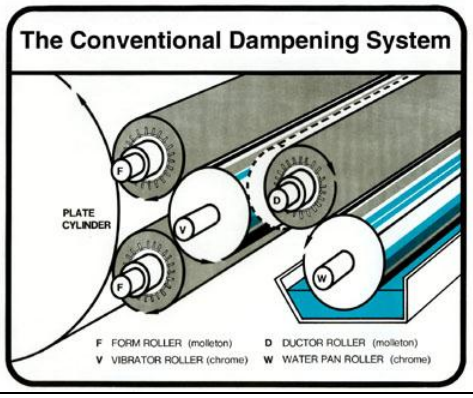
- Unlike the inking system—which allows for variations of ink flow through the use of fountain keys or wedges—a water fountain does not allow for local control of water feed.

- The pointed-arrow type of water stop shown at right is a squeegee that can be adjusted to scrap various amount of water off the water fountain roller.
- These pointed water stops are the most useful water stops.



Practical Activity:

Module: E	**Perform post production activities**	
	Learning Unit: 5-5	Wash dampening rollers
	Practical Description:	Identify the dampening rollers in a printing machine
Time:	**10 min**	
Equipment	Offset printing machine	
Tools	Nylon brush, scrapper	
PPE	Proper dress code, Rubber gloves, safety shoes	
Materials		
Key Point	Make sure you name them correctly.	
Learning Outcome:	The learner will be able to name all the dampening rollers	
Precautions:	Make sure that the machine is shut down	

Instructions	**Illustrations**
1. Shut down the printing machine	
2. Visually observe the dampening system	

3. Note down the names of rollers in order of contact	
4. Show your trainer the names you have written	

Summary of the module:

- The inking system of the Offset printing machine has three basic functions:
    a. To move the ink from the ink fountain to the plate.
    b. To workout the ink into printing conditions.
    c. To remove image repeats on the form from previous printing cycle.
- It consists of 5 main parts; ink fountain duct, ductor roller, oscillator or vibrator roller, distribution roller and form roller.
- Inking rollers are cleaned with undiluted washing solution as in this case only inks will have to be dissolved. But it is better to use roller cleaning paste when ink change from dark to lighter color tones in order to achieve a fast and effective cleaning.
- Ink rollers are damaged by three main factors:
    a. High temperature due to long-run use and friction between rollers.
    b. Abrasive particles in ink or fount solution.
    c. Using wrong cleaning agents which expose roller grain, kerosene oil can reduce the life of rollers as well as printing machine. Rubber gloves should be used to avoid chemical contact.
- Plate cleaning is a very important process in offset printing.
- CTP is a short form of (computer to plate). It should be cleaned from any residue of ink or oil deposit.
- Washing ink from the conventional plate can be for different purposes such as to save the plate for re-use, remove the ink after printing and coat the plate with a special chemical as per SOP that protects the plate.
- Printing blanket transfers ink from the plate cylinder to the offset blanket cylinder. The blanket cylinder has reels or bars to which the blanket is attached. Maintenance of the blanket cylinder is very important to ensure that the gears and bearers are free of paper debris, dried ink, and gum from the dampening solution that can obstruct gear movement and/or cause its damage.
- Impression cylinder carries the paper or other substrate through the printing unit and beneath the inked press blanket. It also provides a hard backing which allows the blanket to press a strong, solid impression on the paper.
- Offset lithography is based on the principle that oil and water do not mix readily, thus the water-based fountain solution ensures that the oil-based ink does not collect in undesirable regions of the printing plate. The dampening system, Moisten the non-image areas of the lithographic plate so that they will not accept ink from the ink form rollers.

Frequently Asked Questions

(FAQs)

Question	Answer
1. What is the function of oscillator?	Oscillator are rollers that rotate and oscillate from side to side, distributing and smoothening out the ink film and erasing image patterns from the form roller.
2. Does Alcohol dampening system have inking system?	Yes, it has
3. Why is emulsification of ink rollers important?	In order to transfer the ink to other rollers and eventually to printing plate.
4. If calcium carbonate removes emulsification in ink rollers then why is it added into the substrates?	Because it is part of the board coating to make the surface glazed and white.
5. Are hard ink rollers better than soft?	Hard ink roller does not transfer ink evenly so it is not better than soft ink roller.
6. What CTP stands for?	CTP stands for Computer to Plate.
7. What are conventional Plates?	Conventional plates are the older version of plates which are still in use. These plates are made from the film
8. What do you meant by plate cleaner?	Plate cleaner is a chemical use to clean offset printing plates which are made of aluminum.
9. Why do we use spanner and Tommy set?	These tools are used to open plate from the plate cylinder. These are the special tools used on printing machine.
10. Why do we clean plates?	We clean plates to remove oil deposit and other dust particle from the plate etc.

11. What is blanket?	Blanket is a resilient rubber material used to receive the ink from the plate image
12. Why the undercut of blanket cylinder is more than the undercut of plate cylinder?	The undercut of blanket cylinder is more than the undercut of plate cylinder because the blanket thickness is more than the plate cylinder.
13. What is the purpose of impression cylinder?	The impression cylinder is used for giving pressure to the blanket cylinder in order to transfer the ink to the paper.
14. Name the most commonly used cylinders in offset printing machine?	a. Plate cylinder b. Blanket cylinder c. Impression cylinder
15. What is the other name of impression cylinder?	Counter cylinder.
16. Where impression cylinder is located?	It is located in the printing section
17. How many types of Dampening systems are there?	There are two types of dampening systems; conventional dampening system and alcohol base dampening systems.
18. What is summing?	Printing produced on non-image area of substrate is called summing.
19. What are the most common causes of SCUM?	Rollers setting, pH value, conductivity, alcohol level.
20. What is dampening solution?	It is the mixture of water and fountain solution in a particular ratio.

Self-Assessment

(MCQs)

Please mark the correct one from the given options. You can check your answer with the Answer Key at the end of this module.

Q 1: What is the fountain duct in an inking system?

a) Ink squirting nozzle

b) It mixes ink and water

c) It calculates ink density

d) Fountain is a pan containing ink

Q 2: Which roller is in contact with the printing plate?

a) Dampening roller

b)Form rollers

c) Ductor roller

d)Distribution roller

Q 3: What is the method of setting a form roller to oscillator?

a) Strip method

b) Touch method

c) Alcohol method

d) Mixing method

Q 4: What is the first step of cleaning ink rollers?

a) Apply cleaning solution

b) Rub ink rollers

c) Remove the remaining ink in the duct

d) Dry the ink in fountain

Q 5: What is plate cleaner?

a) Offset plate cleaner chemical.
b) Cookery cleaner.
c) Car interior cleaner.
d) Floor cleaner.

Q 6: What type of tools uses to open the plate from cylinder?

a) Spanner set and Tommy set.
b) Screw driver.
c) Fork.
d) Glass set.

Q 7: Name the chemical used to clean the plates?

a) Oil.
b) Detergent
c) Plate cleaning chemical
d) Milk.

Q 8: Why do we clean plates?

a) For better quality / for re-use of plates.
b) To eat food
c) To use water properly.
d) For paper run

Q 9: Full form of CTP?

a) Computer to paper.
b) Computer to position
c) Computer to plate
d) Computer to proper job.

Q 10: Blanket cylinder has _____

a) Groves
b) Lines
c) reels or bars
d) Hole

Q 11: First step of cleaning a blanket is

a) Stop the machine and make the machine run in inching/crawling mode.
b) Take off the blanket
c) Run the machine very fast
d) None of the above

Q 12: What is the purpose of the Blanket?

a) Transfers oil to the rollers
b) Transfers the inked image to the paper
c) Transfer water to the non-image area.
d) All of the above

Q 13: What is offset blanket made off?

a) Steel
b) Plastic
c) Rubber
d) Wood

Q 14: The metal cylinder presses the substrate against the inked blanket cylinder transferring the inked image to the substrate.

a) Impression cylinder
b) Blanket cylinder
c) Plate cylinder
d) Transfer cylinder

Q 15: Which of the following cylinder is in contact with impression?

a) Blanket cylinder and substrate.
b) Ink roller and dampening roller
c) Plate cylinder and blanket cylinder
d) Ink fountain and oselator.

Q 16: Which is not a cylinder in offset printing machine?

a) Blanket cylinder.
b) Impression cylinder
c) Plate cylinder.
d) Gas cylinder.

Q 17: What is the first step of cleaning the impression cylinder?

a) Stop the machine and make the machine run in inching/crawling mode.
b) Switch off machine
c) Run machine at its highest level.
d) Do not remove safety.

Q 18: The surface of the impression cylinder possesses

a) No undercut
b) No uppercut
c) No outer cut.
d) No inner cut.

Q 19: What additives are used to reduce the water?

a) IPA
b) Sulfuric acid
c) Acetic acid
d) None of above

Q 20: What pH value is required in Offset printing?

a) 6.6 – 6.5

b) 5.5 – 6.5
c) 4.5 -5.5
d) 9.9 – 9.1

Q 21: The level of water in the fountain…

a) Remains the same
b) Varies
c) Increases
d) None of the above

Q 22: Why alcohol is used at high percentages compared to other fountain ingredients?

a) Improve the image
b) Faster running the machine
c) Increase productivity
d) Decrease productivity

Q 23. What is the purpose of Roller cleaning?

a) To remove the residual ink from the rollers
b) To increase water temperature
c) Printing plate cleaning
d) To clean the impression cylinder

Q 24. Life span of printing rollers is reduced if adopt following measures?

a) Use kerosene oil
b) Use roller wash chemicals
c) use roller cleaning paste
d) IPA

Q 25. Printing plate is cleaned to:

a) Clear scum from plate
b) Maintain PH value
c) Correct registration
d) Maintain ink and water balance

Q 26. The process of applying a thin coating of an adhesive on printing plate:

a) Guttering
b) Gumming
c) Desensitizing
d) De-composing

Q 27. State method of washing ink from plate?

a) Plate cleaner
b) roller wash
c) IPA
d) Fountain solution

Q 28. Ink image is transferred from plate to substrate by?

a) Blanket
b) Impression cylinder
c) Roller
d) Damping rollers

Q 29. What will happen if blanket is not washed during printing?

a) Scum on printed sheet
b) Miss-registration
c) Color variation
d) Speed loss

Q 30. The hard metal cylinder presses the paper against the inked blanket cylinder, transferring the inked image to the substrate. What is this cylinder called?

a) Impression Cylinder
b) Feeder
c) Blanket cylinder
d) Rubber blanket

Q 31. Which machine part transfer water to printing plate?

a) Damping unit
b) Blanket cylinder
c) Ink duct
d) Impression cylinder

Q 32. The tool used to clean ink roller is:

a) Cleaning brush
b) Ink knife
c) Sheet separator
d) Offset shovel

Answer Key

MCQ No.	Correct Answer
1	d
2	b
3	a
4	c
5	a
6	a
7	c
8	a
9	c
10	c
11	a
12	b
13	c
14	a
15	a
16	d
17	a
18	a
19	a
20	c
21	b

22	**a**
23	**a**
24	**a**
25	**a**
26	**b**
27	**a**
28	**a**
29	**a**
30	**a**
31	**a**
32	**b**

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Module-F

Module F: - Complete Documentation Requirements

Learning Outcomes:

After completion of this module the learner will be able to do:

- Record activity span of workday on operation/worksheet,
- Record irregular work hours on operation/worksheet,
- Maintain over time record as per printing press sops.
- Verify consumables availability through inventory and mark check list,
- Verify availability of desired tools through stock inventory,
- Report stocks consumption according to job,
- Request for material on prescribed indent format,
- Carryout consumed items disposal record in consumable register
- Keep machine log updated as per SOPs
- Keep production log updated as per SOPs.

Learning Unit 6-1:

Remember:
Erase your Risk with proper Documentation

Document work time

Overview:

Document work time is important in making an assessment about the productivity of a machine operator. This document provides a clear picture to the line manager/supervisor about Assistant machine operator's actions, positive contributions, reward and recognition, and accomplishment of goals.
All such documents, allows the supervisor and machine man to keep a record of the all that happened during an entire job. It provides a written record that may be necessary when deciding about Assistant machine operator's efficiency.

Necessity of work time record keeping:

The work time documentation is highly recommended so that printing supervisors and managers have a record of Assistant machine operators spanning a period of time.

How does it work?

Documentation by an assistant machine operator will allow the supervisor to make an assessment about his productivity. For example, the daily production sheet should give a fair idea about the number of sheets printed during an entire shift and reason for any lapses in the overall productivity. If entire process is being recorded correctly, it will help supervisor to decide whether to discipline or reward the assistant machine operator accordingly. Without documentation, it will be difficult to make a fair case for any of these actions.

Learning Unit 6-2:

Document Information

Overview:

This learning unit defines verification process of availability of consumables items/ materials, desired tools/equipment and stock consumption according to job, requests for material on prescribed indent format.

Importance of Document:

The checklist of consumables/non consumable items/tools is prepared to ensure the availability of materials which will be needed during perform operations in production process. It should be in accordance with the desired task/job to avoid the production delays due to unavailability of consumables items, tools & materials.

If something found missing or unavailable on floor/workspace at the time of production, arrange it before to start the production or contact with relevant person/department in your press.

Inappropriate quantities or unavailability of consumable items, tools & materials will raise delays in your timelines& productivity.

Sufficient inventories are also beneficial to perform operation faster in your production process.

Consumable Material:

Consumables (also known as consumable goods, non-durable goods, or soft goods) are materials that are intended to be consumed.

In printing press following are the consumable material;

- Substrate (paper & board varieties)
- Printing plates
- Printing chemicals
- Printing inks
- Blanket
- Grease
- Oil
- Dampening cloth
- Cotton rag

Non consumable Material:

Those materials / items which are used whenever required or in other words non-consumable items are those that cannot be used again or useless.

Below are some examples of non-consumable material

- Bearing
- Roller bearing
- Gadgets
- Machine's spare parts

Customer's feedback and its importance:

Customer feedback is information provided by clients about whether they are satisfied or dissatisfied with a product or service and about general experience they had with the press.

Their opinion is a resource for improving customer experience and adjusting your actions to their needs.

Class/workshop Activity:

- Verify the job ticket/sequence with Production Manager or designated person.
- Check& verify the exact qty/size/GSM/grain of required paper/substrates which is mentioned on job cards.
- Ensure the availability of right plates for desired job.
- Arrange the required inks/shades/chemical & other consumables which will needed to perform the job.
- Ensure the availability of tools & equipment in working order.
- Your devices/gadgets & scales always synchronize or maintain as per define SOP by designated persons/departments as and when needed.
- Generate pre-requisition by relevant person as per define company policy of short or out of stock material before starting the job.
- When job done, report to Production Manager or relevant person to carry out your consumables & materials to LOGIN or LOGOUT as per need for inventory record.

Learning Unit 6-3:

Maintain machine log

Overview:

This learning unit describes the importance of Machine log and production log.

Maintain and update machine log as per SOPs:
Record keeping and checking of list task performed on offset printing machine such as machine periodically maintenance, chiller maintenance and other maintenance tasks performed as per SOP's.

Machining production log for the jobs given to the machine operator and keeping all the production records as per given SOP's.

Do You Know??

Machine log data is ***machine*** generated data &***users log*** is used to provide insights to improve operational Intelligence

Machine log is a written document and check list of the activity performed such as:

- Periodical maintenance
- Oil and water checking timely
- Checking and replacing of any bearing and other parts as define as per SOP's
- Maintain consumables which are needed for operation of printing press
- Machine fault time

Practical Activity:

By performing machine maintenance task fill in following log sheet:

S. NO	Periodical Maintenance	Oil Level	Water level	Consumable used

Maintain and update Production log as per SOPs:

Production logs are run for the purpose of analyzing dynamic well performance and the productivity of different zones of printing press, diagnosing problem wells, or monitoring the results.

Production log is a written document which includes following:

- Description of job
- Plates quantity
- Total printing impression
- Total make ready
- Total machine time

Practical Activity:

With the help of production reports fill in following production log as per SOPs:

Date	Mac #	Name	Shift	Job Name	Plates	Impression	Duty Time	Total Mach. Time	Excess Production	Less Production

Summary of the module:

- Documenting a machine operator's performance will allow the supervisor to make an assessment about his productivity. Without documentation, it will be difficult to make a fair case for any of these actions.
- Consumables materials are those intended to be consumed.
- Non consumable Material are used whenever required or in other words non-consumable items are those that cannot be used up or useless.
- The checklist of consumables/non consumable items/tools is prepared to ensure the availability of materials which will be needed during perform operations in production process.
- Customer feedback is any information/requirement provided by clients about whether they are satisfied or dissatisfied with a product or service and about general experience they had with the press. Satisfied customer will stay with you. Unhappy customer will eventually find a better alternative to your business and leave.
- Machine log is a written document and check list of the activity performed such as:
    a. Periodical maintenance
    b. Oil and water checking timely
    c. Checking and replacing of any bearing and other parts as define as per SOP's
    d. Maintain consumables which are needed for operation of printing press
    e. Machine fault time
- Production logs are run for the purpose of analyzing dynamic well performance and the productivity of different zones of printing press, diagnosing problem wells, or monitoring the results.

Frequently Asked Questions

(FAQs)

Question	Answer
1. Why is the work time document important?	So that printing supervisors and managers have a record of assistant machine operators spanning a period of time.
2. What assessment can a supervisor make using the work time document?	Documenting an assistant machine operator's performance will allow the supervisor to make an assessment about his productivity.
3. Can document help in determining the actual number of sheets printed during a shift?	Yes, that indeed is one of the objectives of maintaining the Work sheet,
4. What is the importance of work document when supervisor is making an employee appraisal?	Data from the work document will help supervisors to decide whether to discipline or reward the assistant machine operator
5. When should the machine man complete this work document?	As close to when the action takes place so that records are timely and accurate.
6. Does documenting production affect my salary?	Yes, every time you do not report an anomaly in production it will be considered your lack of work
7. How to define substrate consumption?	From Job card will define the actual substrate consumption.
8. Can we use other GRAIN/GSMs due to unavailability of desired substrate?	NO. Because another GRAIN/GSM of substrate will not comply the quality of costumer's defined finish product, will cause rejection
9. Can we RUN our job if something is missing?	NO. Because it will hurt your performance & productivity timelines, everything is interrelated with each operation.
10. What is the importance of calibrated scale or gadgets?	This will allow your operation as per desired standards/quality measures

11. Why should we do periodical maintenance?	Periodical maintenance is done for smooth and breakdown-free production of machine and it is also recommended by manufacturer for best printing results.
12. What are the required level of oil and water?	The required level of oil and water is mentioned on the machine tank and follow the OEM.
13. What is the machine run time?	Run time in which machine is in production and in working condition.
14. Why should we fill maintenances and production log?	To keep the record of the activity done and changes made in machine such as replacing parts and bearing or any other electric component and keeping record of the production activity for best results in printing process

Self-Assessment

(MCQs)

Please mark the correct one from the given options. You can check your answer with the Answer Key at the end of this module.

Q-1: The work time documentation of critical incidents, is highly recommended so that

a) printing supervisors and managers have a record of assistant machine operators;
b) works as an attendance sheet;
c) To discipline the machine man;
d) None of the above.

Q-2 When assistant machine operator should record data in the work time document:

a) Whenever he deems it necessary
b) As close to when the action takes place
c) At the end of the shift
d) At the end of the week

Q-3 If the production goal are 5000 units and total produced units are 4500, what is the percentage of actual units produced

a) 95%
b) 85%
c) 90%
d) 92%

Q-4 If the actual units required are 130 and produced units are 118, there is a variance of

a) 10 units;
b) 12 units;
c) 20 units;
d) None of the above.

Q-5 If the orders placed are 960 and units produced are 934, then the number variance units and the percentage fulfilled is:

a) 26 units and 97%;
b) 30 units and 90%
c) 25 units and 97%
d) 20 units and 92%

Q-6 Which consumables are mixed in water in offset printing machines?

a) Fountain solution
b) Cocking oil
c) Lubricant oil
d) Acid

Q-7 What is the most important part in filling machine log?

a) Name
b) Address
c) Consumables & different level checks
d) Duty time

Q-8 What is the most important part in filling production log?

a) Name
b) Duty time
c) Consumables & different level checks
d) Printing impression

Q-9 What is the best choice for description of job?

a) Job detail and name
b) Plate quantity
c) Printing impression quantity
d) Consumable check list

Answer Key

MCQ No.	Correct Answer
1	a
2	b
3	c
4	b
5	a
6	a
7	c
8	d
9	a

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Module-G

Module G: Adhere to Safety Standards and Regulations

Learning Outcomes:

After completion of this module the learner will be able to do:

- Interpret work processes and procedures to identify risk of hazards at printing press,
- Recognize printing processes, tools, equipment and consumable materials that have the potential to cause harm,
- Identify potential hazards to minimize accident risk,
- Take appropriate action to minimize the risk.
- Complying with health and safety precautions &relevant
- Guidelines,
- Identify OHS hazards in printing press to prevent from potential for accidents,
- Deal with problems which are within assistant printing machine operator's control,
- Report safety issues which are out of assistant machine operator's control,
- Adopt dress code as per printing press sop.
- Select personal protective equipment in terms of type and quantity according to work orders,
- Verify personal protective equipment to ensure optimum protection in compliance with press room procedures,
- Ensure personal protective equipment hygiene in compliance with press room procedures.
- Apply dress code in accordance with press room procedures,
- Follow rules to ensure personal safety as well as safety of others as per press room procedures,
- Demonstrate housekeeping in the workplace by cleaning up spills or leaks,
- Keep work area clear from obstructions as per safety policies,
- Ensure tools or equipment in place prescribed as per company procedures.
- Make decision in the process of fighting a fire as per sops,
- Stop fire by applying fire-fighting policies,
- Apply safety precautions when fighting a fire,
- Apply the procedures after a fire has been put out as per sops.

Learning Unit 7-1:

Identify hazards in printing press environment

Overview:

This learning unit explains the identification of hazard in printing industry.

It also describes the precautions, techniques and procedures to deal with hazards.

Health & safety precautions:

A clean workplace means more than just having a sparkling, fresh building. A clean workplace also ensures the safety and health of employees and visitors. In 2012 alone, nearly 3 million nonfatal workplace injuries and illnesses were reported by private industry employers. Workplace injuries can be prevented by taking action to ensure a clean, safe work environment.
Here are some reasons why a clean workplace also means a safe workplace:

1. **Clean, dry floors to prevent slips and falls.**
   Maintaining clean, dry floors is essential for the prevention of slips and falls in the workplace. In addition, keep your floors dry by using absorbent materials, such as floor mats, in functional locations to remove moisture and soil from the bottom of shoes.

2. **Proper air filtration lowers employee exposure to hazardous substances.**
   You may not see them, but dusts and vapors are hazardous substances that can create an unsafe environment for employees. Building ventilation is one important factor in reducing airborne transmission of respiratory infections and maintaining the health and productivity of workers. Maintaining humidity around 40 to 60 percent through the use of a dehumidifier is also important in eliminating air pollutants and promoting clean air in the workplace.

3. **Clean light fixtures improve lighting efficiency.**
   Dirty light fixtures can reduce essential light levels, making it difficult and unsafe for employees to complete their daily tasks. Clean light fixtures significantly improve lighting efficiency in the workplace. Sometimes we need special graphic lights. Well-lit stairways and aisles are also important in preventing accidents and maintaining a safe work environment.

4. **Proper disposal of waste and recyclable materials keeps work areas clutter-free.**
   Allowing trash to pile up not only produces clutter, but it also presents a breeding ground for pests that pose a threat to your work environment. Placing “no-touch” wastebaskets in key locations throughout your facility ensures materials are disposed of and reduces the spread of germs. Recycling materials using clearly labeled waste receptacles also makes for a more sustainable environment.
5. Worker must be in proper uniform, loose clothing should not be allowed.
6. All hazardous chemicals and solvent should be kept away from the machine area.
7. All the electric connections should be connected properly and there should be no leakage.
8. All wire connected to machine must be well insulated.
9. If found any unusual thing report immediately to the supervisor/senior personnel.

Practical Activity:

Module: G	**Adhere to safety standard and regulations**	
	Learning Unit: 7-1	Identify hazards in printing press environment
	Practical Description:	Interpret work processes and procedures to identify risk of hazard at printing press
Time:	**2 hours**	
Equipment	N/A	
Tools	N/A	
PPE	Proper dress code, safety shoes, safety gloves, mask	
Materials	Copy of SOP's, Copy of safety guide, Machine manual	
Key Point	Make sure personal safety	
Learning Outcome:	Interpret work processes and procedures to identify risk of hazards at printing press	
Precautions:	Ensure safety	

Instructions	**Illustrations**
1. Remove hazardous materials/articles from near to the machine	
2. Check all electric wiring and connection	

3. Remove all used chemicals away from machine and Substrate (paper\board)	
4. Wear working cloth and safety shoes	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-1	Identify hazards in printing press
	Practical Description:	Recognize printing processes, tools, equipment and consumable material that have the potential to cause harm
Time:	**2 hours**	
Equipment	Fire extinguisher	
Tools	N/A	
PPE	Proper dress code, safety shoes, safety gloves, mask	
Materials	Copy of SOP's, Copy of safety guide, List of tools and equipment, Machine manual, Chemical, Solvents, First aid box	
Key Point	Recognize hazards	
Learning Outcome:	The learner will be able to Recognize printing processes, tools, equipment and consumable material that have the potential to cause harm	
Precautions:	Ensure safety	

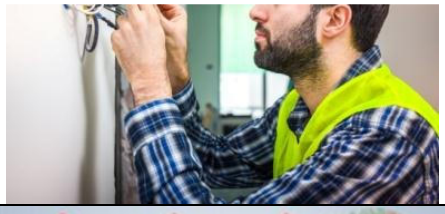
Instructions	**Illustrations**
1. Arrange the required tool set equipment in order	
2. Store chemicals and solvents at appropriate place	

3. Segregate the hazardous chemicals, equipment, tools and solvents which have to cause harm	
4. Clean the tools after completion of task	
5. Store the tools, equipment, chemicals and solvents to their respective places	
6. Wash your hands with soap.	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-1	Identify hazards in printing press
	Practical Description:	Identify potential hazards & take appropriate actions to minimize the risk
Time:	**4 hours**	
Equipment	Offset printing machine	
Tools	N/A	
PPE	Proper dress code, safety shoes, safety gloves	
Materials	Copy of SOP's, Copy of safety guide, List of tools and equipment, Machine manual, Health and safety manual, health and safety posters	
Key Point	Recognize hazards	
Learning Outcome:	Identify potential hazards to minimize accident risk & take appropriate action to minimize the risk	
Precautions:	Make sure personal safety	

Instructions	**Illustrations**
1. Wear dress according to press room requirement	

2. Wear gloves	
3. Keep hazardous chemical and solvents away from the machine	
4. Check electric wiring and electric connection of the machine	
5. After using the chemicals and solvents, place them to their respective places	
6. Check oil level of the machine	
7. Remove all used articles and dispose off them accordingly	

8. After completing the task, Wash hands with any soap properly	

Learning Unit 7-2:

Comply with occupational health and safety (OHS) precautious

Overview:

This learning unit states the OHS procedure, risk and hazards that cause harm to health and safety.

Occupational Health & safety procedures:

A workplace health and safety program is a process for managing the prevention of work-related injuries and diseases in the workplace.

Workplace safety procedures and instructions:

Safe work practices are generally written methods that define how tasks are performed while minimizing risks to people, equipment, materials, environment, and processes. Safe Work Procedures are documented procedures for performing tasks.

Purpose of Workplace safety procedures and instructions:

Safe Work Procedures are documented procedures for performing tasks. The purpose of a safe work procedure is to reduce the risk to health and safety in the workplace and reduce the likelihood of an injury by ensuring that employees know how to work safely when carrying out the tasks involved in their jobs.

The purpose of a safe work procedure is to reduce the risk to health and safety in the workplace and reduce the likelihood of an injury through improving employees know how to work safely when carrying out the tasks involved in their jobs.

Different types of Workplace safety procedures and instructions:

Accessibility

Provide full accessibility to electrical control panels. Never block the panels, which are used to shut down power in an emergency, with materials or other equipment. Also, never block sprinklers, firefighting equipment or emergency exits and observe clearances when stacking materials.

Handling chemicals – these involves procedures on how to handle chemicals in workplace where these are used.
Lifting and moving objects – are procedures that pertain to how objects are to be lifted and moved safely and without strain to the person or worker.

Working at heights – these are procedures that underscore what a worker must observe to keep himself safe while working in an elevated structure or environment.

Slips, trips and falls – are procedures that pertain to safety procedures that should be in place to prevent slips, trips and fall accidents in the workplace.

Proper Waste Disposal

Discard fire hazards like oily rags by placing them in a covered metal container and emptying it on a regular basis.

Housekeeping – are procedures that pertain to how housekeeping activities should be done while keeping in mind safety, health and well-being of workers in a facility or workplace.

Electrical equipment – these are safety procedures that pertain to the installation, repair and maintenance of electrical equipment.

Maintenance

Make sure the machines in your workplace are properly maintained to prevent overheating and friction sparks. Check and perform maintenance on machines regularly and keep a record of this routine maintenance

Fully Charged Fire Extinguishers

Check fire extinguishers often by looking at the gauges and making sure they're fully charged and ready for use. If they're not fully charged or if the attached tag indicates that the last inspection occurred more than a month ago, call for maintenance. Also, encourage all workers to learn how to use a fire extinguisher and provide the proper training.

Emergency Numbers and Proper Signage

Emergency phone numbers, as well as your company address, should be posted by the phone station for quick access. If necessary, create additional information sheets in the native languages for your employees. Make sure you have exit signs installed in your facility and a fire evacuation plan in the event of an emergency.

Fire Drills and Evacuation Plan

Conduct fire drills at least twice a year and have a designated spot where employees will meet once they exit the building. Assign employees to be fire drill captains and make sure everyone knows what the proper procedure is. Review your plan with your local fire company to assess its effectiveness.

Components or elements of Workplace safety procedures and instructions:

The following steps should be followed to ensure a sound safe work procedure is developed:

1. **Observe the task/activities: I**t is important to observe the task/activity being performed the preferred way to ensure safest method is documented.

Remember:
Safety Tips

- If you are not sure…..ask.
- Follow instructions and don't take chances.
- Wear your personal safety equipment.
- Never operate equipment you have not been trained for.
- Keep your work area clean.
- Avoid injury by lifting correctly. If it's heavy ask for help. Max weight to be lifted is 40 kgs.
- Make sure the job can be done safely

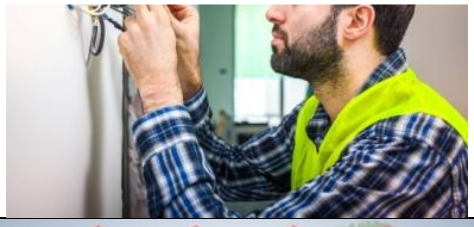
2. **Review associated legislative requirements:** Some task/activities are governed by legislative requirements. These must be considered when developing a safe work procedure to ensure any legal requirements are included.
3. **Record the sequence of basic job steps:** write down the steps that make up the task/activity.
4. **Record potential hazards of each step:** Next to each step identify what may have potential to cause injury or disease
5. **Identify ways of eliminating and controlling the hazards:** list the measures that need to be put in place to eliminate or control any likely risk.
6. **Test the procedure:** Observe staff/student following the safe work procedure
7. **Obtain approval:** Before the safe work procedure can be used it must be approved by each approver nominated.

8. **Monitor and review:** Make sure the activity is supervised to ensure the documented process is being followed.

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-2	**Comply with occupational health and safety (OHS) precautious**
	Practical Description:	Comply with health and safety precautions and relevant guidelines and identify OHS hazards in printing press to prevent from potential accidents
Time:	**1 hour**	
Equipment	N/A	
Tools	N/A	
PPE	Mask, Gloves, Tight cloths as per SOP's of press room, safety shoes	
Materials	Copy of guideline of safety and health precautions, copy of Occupational health and safety (OHS) hazards SOP's,	
Key Point	Make sure personal safety	
Learning Outcome:	Comply with health and safety precautions and relevant guidelines and identify OHS hazards in printing press to prevent from potential or accidents	
Precautions:	Safety first	

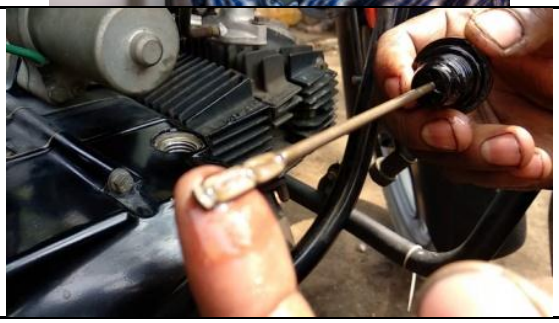
Instructions	**Illustrations**
1. adopt proper dress code	
2. Ensure cleaning of surrounding area	

3. Check electric phases and connections	
4. Keep hazardous articles at their proper place	
5. Check the oil level of machine	
6. Arrange tools in order	
7. Ensure safe handling of tools	
8. Perform Inching of printing machine	

9. Remove and dispose of used and waste articles as per SOPs	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-2	**Comply with occupational health and safety (OHS) precautious**
	Practical Description:	Dealing of problems which are within assistant machine operator's control and which are out of assistant machine operator's control and its reporting
Time:	**2 hours**	
Equipment	Offset printing machine	
Tools	N/A	
PPE	Proper dress code, safety gloves, mask, safety shoes	
Materials	Machine oil & IPA, Cleaning agent (solvent), Cleaning cloth	
Key Point	Never use any machine/equipment you have not been trained to use.	
Learning Outcome:	Dealing of problems safely	
Precautions:	Ensure safety	

Instructions	**Illustrations**
1. Check electric connection, phase of machine	
2. Check oil level of machine	
3. Learner will be able to perform the following tasks:	

a. Check water level in machine b. Fix the plate c. Check the blanket d. Maintain the humidity according to SOPs e. Use of different consumables	
4. The following issues shall not be dealt by the assistant machine operator and must be reported to supervisor a. Machine break down b. Sparking / fire in electrical circuit board c. Ventilation problem d. Humidity level is less than 40 degree	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-2	**Comply with occupational health and safety (OHS) precautious**
	Practical Description:	Adoption of dress code as per printing press SOPs
Time:	**2 hours**	
Equipment	N/A	
Tools	N/A	
PPE	Tight cloths as per SOP's of press room, Mask, Gloves, safety shoes	
Materials		
Key Point	Make sure personal safety	
Learning Outcome:	The learner will be able to adopt dress code as per printing press SOPs	
Precautions:		

Instructions	**Illustrations**
1. Wear proper well-fitted pants and T shirt	
2. Wear safety shoes	

3. Wear gloves	
4. Wear mask	

Learning Unit 7-3:

Use personal protective equipment (PPE)

Overview:

This learning unit describes the importance and types of personal protective equipment in printing industry.

Personal Protective Equipment

Wearing personal protective equipment (PPE) can prevent accidents from happening. As a worker, you are responsible for the following:

- Making sure your uniform is well fitted.
- Keeping all uniforms clean and in good condition
- Wearing specific personal safety equipment such as gloves, and aprons when required.

To ensure that you are protecting yourself, your personal protective equipment (PPE) list should include the following items.

Clothing

This includes well-fitted pants and T shirt with all buttons fastened. Sleeves should be

close fitting.

Protective clothing protects the skin or personal clothing from contact with hazardous chemicals and prevents spread of contamination. When handling printing inks or solvents, such as dispensing, storage, and conducting maintenance work, employees should always wear suitable protective clothing.

Footwear

The OHS Regulation requires that approved footwear must be worn by employees in all industrial occupations. Footwear must have a non-slip sole and a closed toe and closed back.

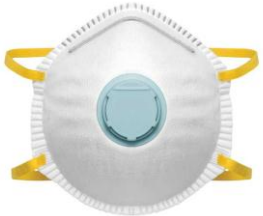
Your footwear should be sturdy and comfortable.

Hand protection

As printing workers frequently have to handle many hazardous chemicals by hands, chemical resistant gloves have to be used. Thick plastic, gloves should be used when handling cleaning products.

Respirators

Respirators should be used to protect yourself from inhaling harmful fumes or vapors. The respirator unit should be properly fitted to provide the best protection. Check the components to ensure they are not broken, cracked, or torn and that they do not have holes. Replace faulty components before use. Each unit will have a filter that should be



checked regularly and replaced before the expiration date.

Practical Activity:

Module: G	**Adhere to safety standards and regulations**

	Learning Unit: 7-3	**Use personal protective equipment (PPE)**
	Practical Description:	Selection of personal protective equipment PPE in terms of type and quantity according to work order and verification of PPE to ensure optimum protection in compliance with press room procedures
Time:	**30 min**	
Equipment	N/A	
Tools	N/A	
PPE	Tight cloths as per SOP's of press room, Mask, Gloves, safety shoes, First aid box	
Materials	First aid box	
Key Point	Safety First	
Learning Outcome:	Selection and verification of personal protective equipment (PPE) to ensure optimum protection in compliance with press room procedures	
Precautions:		

Instructions	**Illustrations**
1. Wear proper dress	
2. Wear safety shoes	
3. Wear gloves	

4. Check first aid box and its articles	
5. Read carefully the SOPs of PPE	
6. Check whether all the PPE procedure for press room has be complied	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-3	Use personal protective equipment (PPE)
	Practical Description:	Ensure personal protective equipment hygiene in compliance with press room procedures
Time:	2 hours	
Equipment	N/A	
Tools	N/A	
PPE	Proper dress, safety shoes, safety gloves	
Materials	Dust bin, first aid box	
Key Point	Safety first.	
Learning Outcome:	Ensure personal protective equipment hygiene in compliance with press room procedures	
Precautions:		

Instructions	**Illustrations**
1. Adopt proper PPEs	 
2. Dispose off waste material immediately	

3. Do not left chemicals and solvents open, after performing job	
4. In the end, wash your hands properly	
5. The press room must have good ventilation system	

Learning Unit 7-4:

Practical safe work habits to ensure safety in the printing environment

Overview:

This learning unit describes about safety, safety procedure and cleaning and storing of tools and equipment.

Importance of Safety:

The most important concept to remember is that you are responsible for your own safety and the safety of others. Most safety practices are common sense. Unfortunately, they can be forgotten or overlooked unless you make safe practices a habit or an instinct.

Remember: Never use any machine you have not been trained to use.

Work safety procedures:

By doing things right, you and your co-workers will commit yourselves to safety on the job and everyone will benefit. Accidents occur in many ways but most often can be traced back to one of two basic factors: ignorance or carelessness. You must always be concerned with your own safety and with the safety of others around you.

The following is a general list of safety precautions you must observe in any work area:

- Don't fool around. "Horseplay" is one of the biggest causes of injuries on the job and it may be grounds for dismissal.
- Never work while under the influence of drugs or alcohol, as you are a hazard to yourself and your co-workers.
- Pay particular attention to moving parts of the machine.
- Walk; do not run, in the work areas.
- Stay completely alert on the job.
- Avoid back strain by lifting properly.

Procedures for equipment/Machine

- Pull plug or throw switch to off position before cleaning or adjusting any machine. Keep fingers, hands, etc., away from moving parts. Wait until machine stops.
- Check all switches to see that they are off before plugging into the outlet.

- Never use any machine you have not been trained to use.
- Particular care must be taken when cleaning the printing machine. First pull the plug.
- Never start a machine until you are sure all parts are in their proper places. If it is a machine that operates with gears, check the gear position.
- You must be aware of the lock-out procedures that are to be followed before repairing or cleaning any machine. Lock-out procedures must be clearly posted by management near each machine.
- When using electrical power equipment, always follow the manufacturer's instructions and recommendations. Do not wear rings, a wristwatch, or a tie when operating electrical power equipment.

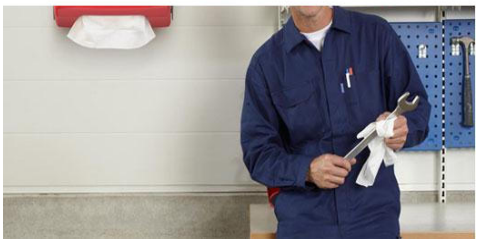
Method of Cleaning and Storing Basic Hand Tools

Cleaning of Hand Tools:

Quality tools should last a lifetime, do a thorough cleanup immediately after each use.

- Usually cleaning with water and soap will do the job. Sticky stuff can be removed with lighter fluid.
- Always dry tools and lightly oil after each cleaning.

- Excess oil should be wiped away, always keep an oil soaked rag handy and use it to wipe down tools before putting them away.
- Cleaning your hand tools from time to time will prevent rust buildup and can lengthen the life of your tools.
- A tool should always be kept clean and free of dust so that it remains in a good condition and a tool in good condition gives the maximum efficiency.
- When rust forms on tools, remove it by using a fine abrasive cloth or scrubber.
- The moving parts of the tools must be kept working freely and hence it is necessary to lubricate them regularly.



Storing of Hand Tools:

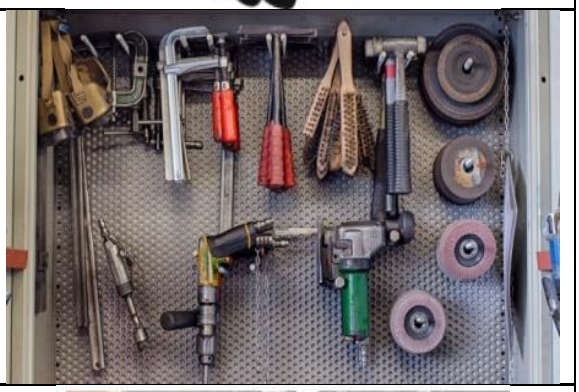
- Tools should be kept in a tool box or a tool cabinet or work bench.
- Each tool should be kept in its own individual place so that it is easily accessible and can be replaced readily after they have been used.
- The compartments in a tool box or a cabinet should be designed and placed in such a way that there is no danger of one tool coming in contact with the other.
- Tools should not lie idle on the floor or in the working area as they are a hazard to anyone working there or passing by.

- Sharp tools should be placed in their respective holders so that there is no danger of cutting oneself when picking it out or replacing it.
- Store hand tools in a dry, sheltered environment.
- Place similar tools together so that people can see easily what is available.

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-4	Practice safe work habits to ensure safety in the printing environment
	Practical Description:	Application of dress code in accordance with press room procedures and follow rules to ensure personal safety as well as safety of others as per press room procedure
Time:	**2 hours**	
Equipment	N/A	
Tools	N/A	
PPE	Proper dress, safety gloves, safety shoes, mask	
Materials	First aid box	
Key Point	Personal safety as well as safety of others as per press room procedure	
Learning Outcome:	Application of dress code in accordance with press room procedures	
Precautions:	Safety First	

Instructions	**Illustrations**
1. Wear tight cloths	
2. Wear safety shoes	

3. Wear gloves	
4. Always place tools to their respective positions	
5. Handle tools and equipment carefully	
6. Never leave chemicals and solvents open	
7. Always follow SOPs	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-4	Practice safe work habits to ensure safety in the printing environment
	Practical Description:	keep work area clear from obstructions as per safety policies
Time:	**2 hours**	
Equipment	N/A	
Tools	N/A	
PPE	Proper dress code, safety shoes, safety gloves	
Materials		
Key Point	Good housekeeping eliminates the risk of accidents	
Learning Outcome:	Demonstrate housekeeping in the workplace by cleaning up spills or leaks and keep work area clear from obstructions as per safety policies	
Precautions:	Safety first	

Instructions	**Illustrations**
1. Clean surrounding area of machine	
2. Remove and clean any leakage of oil from surrounding area of machine	

3. Clean the machine properly	
4. Remove unwanted articles from the press room	
5. Place all tools to their respective positions	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-4	Practice safe work habits to ensure safety in the printing environment
	Practical Description:	Ensure tools or equipment in place prescribed as per company procedures
Time:	**1 hour**	
Equipment	N/A	
Tools	N/A	
PPE	Proper dress code, safety shoes, safety gloves	
Materials		
Key Point	Safe handling & storing of tools/equipment	
Learning Outcome:	Ensure tools or equipment in place prescribed as per company procedures	
Precautions:		

Instructions	**Illustrations**
1. Read company procedure and policy to place the tools accordingly.	
2. Place the tools to their respective places in accordance with company procedure after use.	

Learning Unit 7-5:

Demonstrate Firefighting Skills

Overview:

This learning unit explains the causes and types of fire. It also gives knowledge of firefighting equipment and firefighting method in printing industry.

Causes of fire:

- Fires are caused both when the printing machine is in operation and when it is undergoing cleaning operations and the machine has been shut down.
- The main deficiencies are: machine not cleaned sufficiently, lack of locking mechanisms for ink dryers, and defective electrical and mechanical maintenance.
- The most frequent type of fire in printing presses and workshops is derived from solid combustible materials (**class A fires**), such as paper, cardboard, wooden pallets, dirty cloths, and plastic. There are also combustible liquids used in the production processes that can cause fires (**class B fires**), such as alcohols, oils, and solvents.

Some other causes of fire are:

1. Improper handling of solvents and chemical
2. Substandard and leakage in electric wiring
3. Short circuit in electrical panel or wiring

Types of Fire: There are four types, or classes, of fire:

- **Class A** fires involve solid materials of an organic nature such as wood, paper, cloth, rubber and plastics that do not melt.

- **Class B** fires involve liquids. They include petrol, diesel, thinners, oils, paints, wax, cooking fat and plastics that melt.

- **Class C** fires involve electricity.

- **Class D** fires involve flammable metals such as magnesium, aluminum, titanium, sodium and potassium.

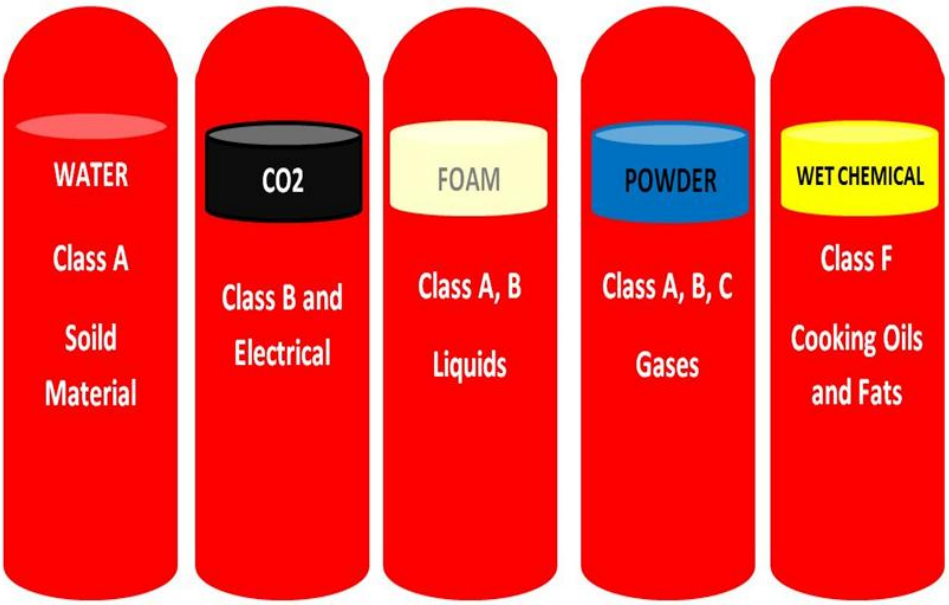
Firefighting equipment:

There is various firefighting equipment:

1. **Fire extinguisher:** A portable apparatus containing chemicals that can be discharged in a rapid stream to extinguish a small fire.

Types of Fire extinguisher: There are four types of fire extinguisher;

- **Water Fire Extinguishers** are recommended for class A fire fighting and are effective in case of wood, paper or plastic ignition. Not suitable for Class B (Liquid) fires, or where electricity is involved.
- **Foam Fire Extinguishers** are more expensive than water, but more versatile. They are used for Classes A & B fires. Foam spray extinguishers are not recommended for fires involving electricity.
- **Dry Powder Fire Extinguishers** contain some powder based agent, able to break the chemical chain reaction, sustaining the fire. Often termed the 'multi-purpose' extinguisher, as it can be used on classes A, B & C fires. Best for running liquid fires (Class B).
- **Carbon Dioxide Fire Extinguishers** Carbon Dioxide is ideal for fires involving electrical apparatus, and will also extinguish class B liquid fires, but has NO POST FIRE SECURITY and the fire could re-ignite.



Fire Extinguisher Chart

Extinguisher		Type of Fire				
Colour	Type	Solids (wood, paper, cloth, etc)	Flammable Liquids	Flammable Gasses	Electrical Equipment	Cooking Oils & Fats
	Water	✓ Yes	✗ No	✗ No	✗ No	✗ No
	Foam	✓ Yes	✓ Yes	✗ No	✗ No	✓ Yes
	Dry Powder	✓ Yes	✓ Yes	✓ Yes	✓ Yes	✗ No
	Carbon Dioxide (CO2)	✗ No	✓ Yes	✗ No	✓ Yes	✓ Yes

2. **Sand/Water Bucket:** A fire sand bucket is steel bucket filled with sand which is used to put out fires. Typically, fire buckets are painted bright red and have the word 'fire' stenciled on them in white lettering. In order to extinguish the fire, the sand in the bucket is dumped on the fire. This method of fighting liquid fires has generally been replaced by modern foaming agents.

3. **Fire Blankets** may be used by firefighters to protect furnishings from water damage during firefighting. A fire blanket is made of fire-resistant material such as fiberglass and is used in smothering a fire. They can also be used if a person’s clothing has caught fire.

4. **Fire Hose** is a high-pressure hose used to carry water extinguish a fire. Outdoors, it is attached either to a fire engine or a fire hydrant. Indoors, it can be permanently attached to a building's plumbing system.

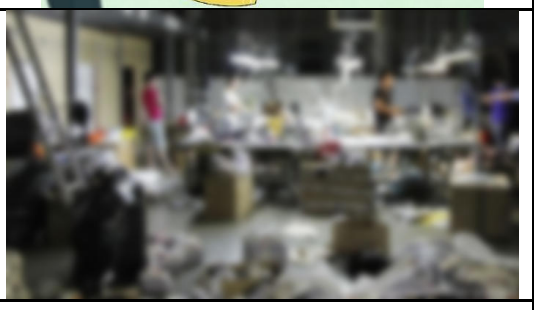
5. **A fire detection and alarm system is** recommended to install these systems on industrial sites in case of outbreaks of fire that may develop at any time when the premises are not occupied.

6. **Emergency lighting and signage**. The evacuation routes shall be provided with emergency lighting and markings so that all occupants can evacuate safely.

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-5	Demonstrate Firefighting Skills
	Practical Description:	Stop fire by applying fire-fighting policies
Time:	**2 hours**	
Equipment	Fire extinguisher	
Tools	N/A	
PPE	Safety clothing, safety shoes, safety gloves, First aid box	
Materials	Dust bins, Fire extinguisher	
Key Point	Apply firefighting policies	
Learning Outcome:	The learner will be able to Make decision in the process of fighting a fire as per SOPs and stop fire by applying fire-fighting policies with safety precautions	
Precautions:	Safety first	

Instructions	**Illustrations**
1. In case of fire immediately inform supervisor	
2. Act on instructions of supervisor, use fire extinguisher accordingly	

3. Wear necessary dress and article before extinguishing the fire	
4. After extinguishing the fire check the press room properly	
5. Shift all the undamaged articles to safe place	
6. Apply SOPs procedure when fire has been put out	

Practical Activity:

Module: G	**Adhere to safety standards and regulations**	
	Learning Unit: 7-5	**Demonstrate Firefighting Skills**
	Practical Description:	Apply the procedures after a fire has been put out as per SOPs
Time:	**2 hours**	
Equipment	Fire extinguisher	
Tools		
PPE	First aid box, safety dress code, safety gloves, safety shoes	
Materials	Dust bins	
Key Point	Act on instructions of supervisor/senior	
Learning Outcome:	The learner will be able to apply the procedures after a fire has been put out as per SOPs	
Precautions:	Ensure personal safety and safety of other coworkers	

Instructions	**Illustrations**
1. Always use safety dress code	

2. Follow a program that includes preparation, prevention, and recognition of fire hazards.	
3. Practice proper handling of combustible and flammable material.	
4. Maintain safe housekeeping practices that reduce the risk of fire danger.	
5. Always keep adequate fire control equipment in your work area to extinguish fire before it goes out of control	

Summary of the module:

Adopt the following occupational and health safety (OHS) measures according to the manual:

- Observe and practice all safety rules, regulations, and advice given in the press manual and by the facilities hazard communication program and lock out / take out program.
- Obey all verbal and written instructions before operating the press.
- Always wear personal protective equipment (PPE)
- Avoid wearing of loose clothing that will become and entangled in any part of the press equipment.
- Ensure stand clear of the equipment when the “run” warning signal is sounded.
- Always make sure the press is completely stopped and the save button is set off before touching machine parts.
- Ensure safe functioning of safety devices
- Never switch off or by pass safety devices.
- Check that all guards, covers and swiveling footrest are securely fastened or completely locked in place before operating the press.
- Clean the ink fountains while the press is stopped and the safe button is pressed to avoid personal injuries and press damage.
- Never work on moving parts with tools because of the high risk of accident and personal injury.

Frequently Asked Questions
(FAQs)

Question	Answer
1. What is PPEs?	PPEs stand for personal protective equipment.
2. Why PPEs are important during printing operation?	PPEs protect the worker from severe injury & accidents.
3. What is safety reporting procedure?	If any unusual thing happen in the press room, inform the supervisor immediately
4. If worker is not wearing industrial shoes what damage may occur?	If worker is not wearing industrial shoes it may harm to his toes.
5. SOP stands for?	SOP stands for Standard operating procedure.
6. What hazard can occur due to substandard electric wiring?	It can cause short circuit.
7. OHS stands for?	It is stand for occupational health and safety
8. How should the worker be dressed on its workplace?	Worker should be in proper dress, no loose clothing and should wear industrial shoes
9. How to prevent electrical hazard in printing press	Check the electric connections before starting the machine and inform supervisor if found any damaged wires

Self-Assessment

MCQs

Please mark the correct one from the given options. You can check your answer with the Answer Key at the end of this module.

Q 1.What can be harm of loose dress?

a. machine can catch loose cloth

b. it can be burnt

c. damage of cloth

d. shrinking of cloth

Q 2.Which PPE is necessary to handling of toxic chemical

a. must wear goggles

b. must wear mask, gloves and shoes

c. must wear mask

d. must wear tight cloth

Q 3.If electrical sparking held, what should we do?

a. Put the water

b. Put the clay

c. Extinguisher

d. Foam chemical

Q 4.What is the benefit of goggles in safety rules

a. It can save face
b. It can save our eyes from dangerous splashing
c. It can save hair
d. It can save dress and shoes

Q 5.Gloves is used for?

a. Save the hands

a. Save the nose

b. Save the elbow

c. Save the forehead

Q 6.What is the benefit of first aid box?

a. save electrical fire

b. save ground of working

c. Immediate medical treatment

d. Save the lives

Q 7.What is the benefit of mask?

a. Safety from dangerous chemical inhaling
b. Safety from burning
c. Safety from area pollution
d. No idea

Q 8.Kerosene oil is used for?

a. Cleaning Floor

b. Cleaning rollers

c. Cleaning tools and machines from outside

d. Cleaning damping roller

Q 9.In any accidental and fire burning problem the learner should _____.

a. Alarm

b. Inform the supervisor

c. Press the Emergency button

d. Extinguisher

Answer Key

MCQ NO.	Correct Answer
1	a
2	b
3	d
4	b
5	a
6	c
7	a
8	c
9	c

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