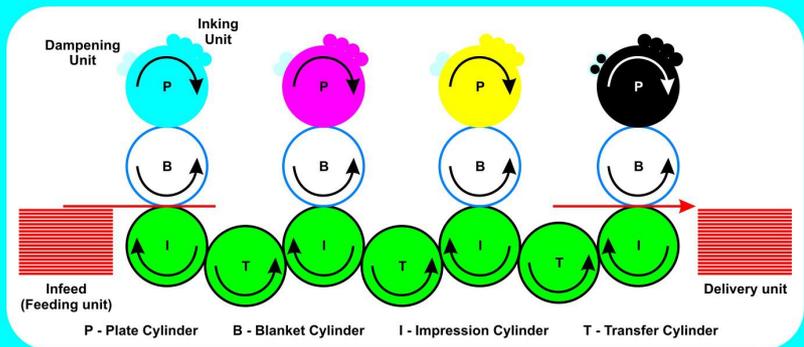
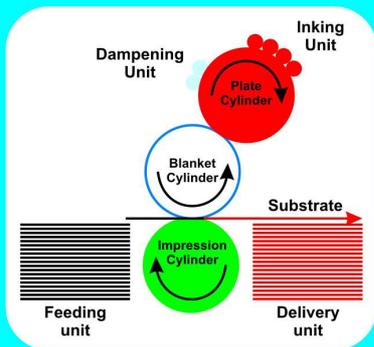


Offset Printing Technology

('M' Scheme)



ALOIS SENEFELDER



LITHO STONE



IRA WASHINGTON RUBEL



Prepared by

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Sivakasi - 626 130.

**OFFSET PRINTING
TECHNOLOGY**

PREFACE

This book of Offset Printing Technology covers all the topics in a clear and organized format for the Second year Diploma in Printing Technology students as prescribed by the Directorate of Technical Education, Chennai, Tamilnadu. It is confidently believed that this book furnishes the students the necessary study material. The topics covered were neatly illustrated for better understanding of the students.

The book is prepared step-by-step lessons in large, eye pleasing calligraphy make it suitable for both direct one-to-one tutoring and regular classroom use. The highlight of this book is its simple English with clear and easy explanation of each topic.

All the topics are explained with supporting diagram for diploma level students to understand effectively.

This book majorly deals with Introduction to Sheetfed Offset Presses, Sheet Control and Delivery in Offset Press, Printing Unit in Offset Press, Webfed Offset Press – Infeed and Web Guiding Devices and Webfed Offset Press – Delivery Unit etc.

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OFFSET PRINTING TECHNOLOGY

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	Introduction to Sheetfed Offset Presses 1.1 - Principles of Lithography and offset printing. 1.2 - Units of offset machine – Feeding unit, Printing unit and Delivery unit. 1.3 - Configuration and Structure of Sheetfed Presses: Single color, Multi color and convertible presses. 1.4 - Type of Presses: Inline Press, Stack Press, Blanket-to-Blanket Press and Common Impression cylinder Press.	12 Hrs.
II	Sheet Control and Delivery in Offset Press 2.1 - Types of Feeders – Friction feeders and Suction feeders, Types of Suction Feeders – Single sheet feeder and Stream Feeder. 2.2 - Feeder Head Components – Feeder Head, Air blast Nozzle, Rear Pickup Suckers, Forwarding Pickup Suckers, Sheet Steadiers, Separator Brushes and fingers. Feed board elements – metal wheel, rubber tyred wheel, brush wheels, tapes and ball smoothener. 2.3 - Sheet Registering Devices – Front lay and Sidelay, Types of Front lay and Side lay. Sheet detectors – double sheet, no sheet and cross sheet detectors. 2.4 - Sheet Insertions Devices – Swing arm, Rotary, Tumbler and Overfeed Grippers. 2.5 - Delivery Section – Delivery Assist Devices, Suction Slow down Rollers, Blow downs, Wedges, Skeleton Wheels, Star Wheels and Anti set-off devices. 2.6 - Make ready operations in offset printing machines and Safety precautions in press room.	13 Hrs.
III	Printing Unit in Offset Press 3.1 - Construction and functions of Plate Cylinder, Blanket Cylinder, Impression Cylinder, Transfer Cylinder and Delivery Cylinder. 3.2 - Types of Blankets: Conventional blanket and Compressible blanket. 3.3 - Inking System – Construction, Roller setting methods: Form Roller to Oscillator and Form Roller to Plate. 3.4 - Inking System Problems - Roller Streaks and Glazed Rollers. 3.5 - Dampening System – Construction, Composition of Dampening Solution - pH, Conductivity and Dampening system Roller setting. Types of Dampening System: Conventional or Intermittent, Continuous dampening system	14 Hrs.

	and Dahlgren dampening system.	
IV	<p>Webfed Offset Press – Infeed and Web Guiding Devices</p> <p>4.1 - Historical development of webfed offset presses. Types of Reel Stands – Single reel stands, Double reel stands and Three reel stands.</p> <p>4.2 - Automatic Splicers – Zero Speed Paster ,Working Principle and function of Zero Speed paster, Purpose of Festoon. Flying Paster – Working Principle and function of Flying paster.</p> <p>4.3 - Web Control – Dancer Roller, Metering Roller, Box Tilt, Web break detectors and Bustle Wheel.</p>	13 Hrs.
V	<p>Webfed Offset Press – Delivery Unit</p> <p>5.1 - Types of Dryers – Open flame, High Velocity Hot Air and Combination Dryer, Chill Rollers – Early stage Chill rolls, Baffle plate Chill rolls and Jacketed Chill rolls.</p> <p>5.2 - Types of Folders – Former folder, Double Former Folder, Jaw Folder, Chopper Folder, Combination Folder and Ribbon Folder.</p> <p>5.3 - Auxiliary Equipments – Stackers, Bundlers, Sheeters, Perforators and Imprinters.</p>	13 Hrs.

UNIT – I

INTRODUCTION TO SHEETFED OFFSET PRESS

History of Offset Lithographic Process

The main planographic process in commercial use today is lithography, a word derived from two Greek works: 'lithos' a stone; and 'graphing', to write. Literally, the word means 'stone writing'. This method of printing from a level surface, made its appearance long after letterpress. It dates 1798 when it was discovered and applied by Alois Senefelder in Bavaria. His discovery depended on the principle that 'grease and water do not mix'.

The artist could draw or transfer the design or lettering directly on to the stone without any limitations of the hand engraver. Later, it was found that the thick stone could be replaced by a thin metal plate (zinc or aluminium) or even a plastic or paper one, capable of being curved around a cylinder on a rotary press. The application of photography to the process provided a means of obtaining a printing image without drawing or transferring by hand.

1.1 PRINCIPLES OF LITHOGRAPHY AND OFFSET PRINTING

Principle of lithography is that 'ink and water do not mix. This is an indirect process. In this process the image and non image areas are in the same level. The image areas are oleophilic (ink receptive). The non image areas are hydrophilic (water receptive). Before coming to the printing department the plate is made to oil and water receptive in the plate making section by chemical treatment. During printing, first the dampening solution is applied over the plate surface, the non image areas only receive the dampening solution. Then ink is applied by the inking roller over the plate surface. The dampening solution present in the non image areas does not allow the ink to form over the non-image areas. The ink is only received by the image areas. During printing the image with ink is transferred to the paper by pressure.

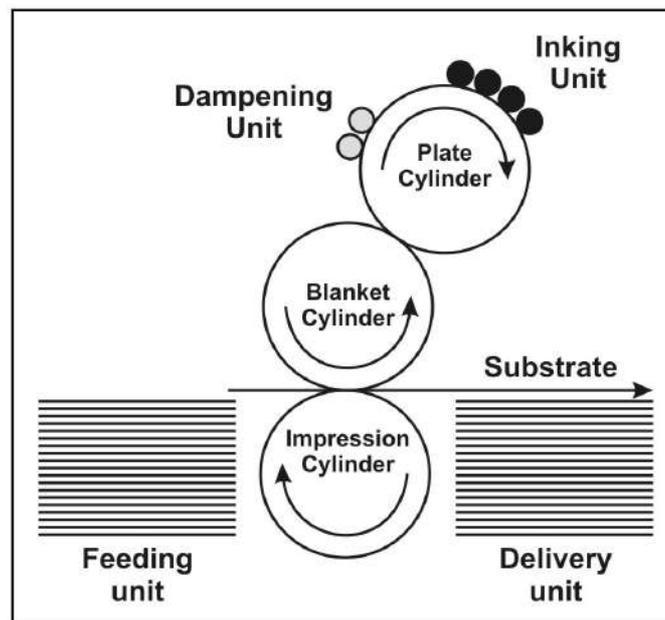
1.2 PRINCIPLE OF OFFSET PRINTING

Offset printing is a commonly used printing technique in which the inked image is transferred (or "offset") from a plate to a rubber blanket, then to the printing surface. When used in combination with the lithographic process, which is based on the repulsion of oil and water, the offset technique employs a flat (planographic) image carrier on which the image to be printed obtains ink from ink rollers, while the non-printing area attracts a water-based film (called "fountain solution"), keeping the non-printing areas ink-free. Development of the offset press came in two versions: in 1875 by Robert Barclay of England for printing on tin. In 1904 by **Ira Washington Rubel** of the United States printed on paper with offset principle which later becomes very famous.

1.2.1 UNITS OF OFFSET MACHINE:

A sheetfed offset press consists of the following units:

1. Feeding Unit
2. Printing Unit
3. Inking Unit
4. Dampening Unit
5. Delivery Unit.



1.2.2 Feeding Unit:

The feeding unit is used to feed the paper into the printing unit. A feeding unit consists of the following parts,

1. *Suckers*: Suckers are used to suck the sheets one by one for transporting the sheets for printing. The suckers are of two types a) Lifting suckers b) Forwarding suckers.
2. *Blowers*: Blowers blow the stream of air to separate the sheets for sucking.
3. *Sheet separation strips*: These strips are flexible fingers present at the feeder head to avoid the passage of double sheets during sucking and forwarding.
4. *Pile board*: This is the board present to stack the unprinted papers for printing. Over the pile board the feeder head is present.
5. *Feed board*: This is present after the pileboard. Over the feedboard the sheet transportation devices are present to move the paper covering from the pileboard into the printing unit. These parts are used to separate and forward the paper for printing.

1.2.3 Printing Unit:

A printing unit is a section of offset machine where the plate is inked and the inked image is transferred to the blanket from which it is finally transferred to the substrate. Printing unit consists of five elements:

a) Plate Cylinder:

This is the cylinder which holds the plate for printing. This cylinder is present over the blanket cylinder. The inking and dampening system are present over plate cylinder. Dampening system applies the water and the inking system applies the ink on the plate present over the plate cylinder and finally it gets applied over the paper.

b) Blanket Cylinder:

The blanket cylinder holds the resilient rubber blanket for printing on its surface. The blanket cylinder is present between the plate and impression cylinder. During printing the blanket cylinder with blanket alone moves and contacts both the plate and impression cylinder to receive the ink from the plate and to transfer the ink to the substrate which passes between the blanket and impression cylinder.

c) Impression Cylinder:

This cylinder is used to give impression to the substrate for the transfer of inked image from the blanket. This cylinder is present below the blanket cylinder. This cylinder gives high pressure during the passage of paper.

d) Inking System:

The inking system have a number of inking rollers which are used to grain and supply the ink from the ink duct to the plate. In the inking system the rubber rollers and metal rollers are arranged alternatively for fine grinding of ink and to avoid roller wear. In the offset machine multiroller inking system is present.

e) Dampening System:

The Dampening unit is also consist of a number of rollers which are used to receive the dampening solution from the fountain duct and to transfer the dampening to the plate. In the dampening system the rubber roller are covered with cloth in order to store and supply the dampening solution during printing. The dampening system is classified into two types, one is conventional dampening system and other one is continuous dampening system.

1.2.4 Delivery Unit:

This unit consists of a number of gripper bars which are used to transfer the printing paper from the impression cylinder grippers to the delivery unit pile board. In the delivery unit with the help of rear joggers, side joggers, front stopper and back stoppers the papers get delivered and neatly stacked in the pileboard. Apart from the devices in the delivery unit,

suction slowdowns, blowdowns and skeleton wheels are also present for the support of delivery of paper. The delivery systems are of two types a) clute delivery b) chain delivery.

1.3 CONFIGURATION AND STRUCTURE OF SHEETFED OFFSET PRESS:

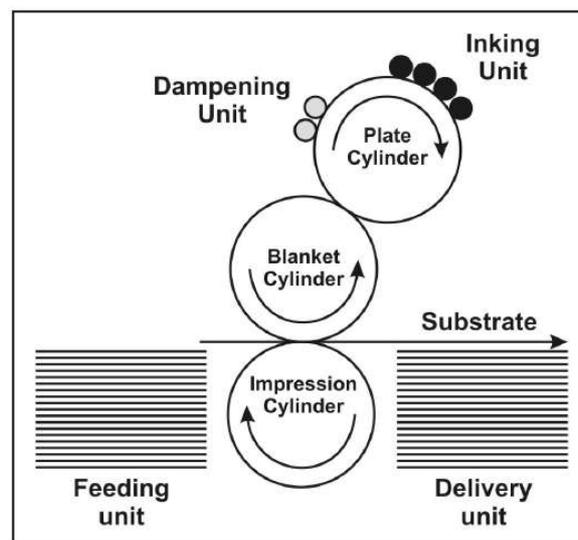
The configuration or structures of sheetfed offset presses are divided into the following categories:

- a. Single color offset press
- b. Multi color Sheet-fed presses
- c. Convertible press

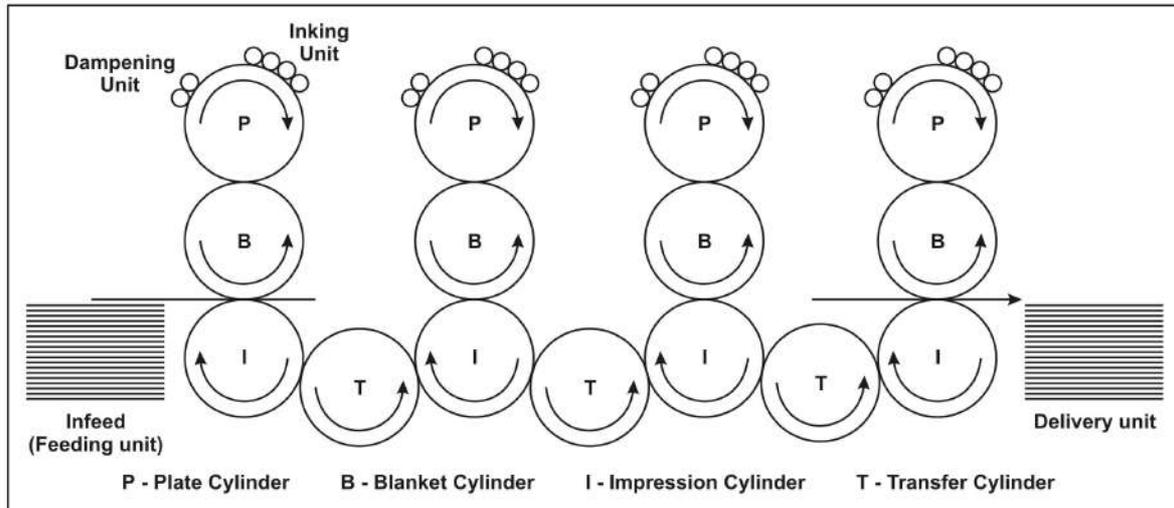
a) *Single color offset press:*

A press consisting of a single printing unit, with its integral inking and dampening systems, a feeder, a sheet transfer system, and a delivery is called a single-color press. Normally, it can print only a single color in any one pass through the press. On some presses, the inking system can be modified - split - with ink fountain ink roller dividers so that two or more colors can be printed at one time. On these presses, the same printing plate is used, and the colors are widely separated.

A single-color press can also be used for true multicolor printing, the printing of two or more colors, often one over another. Multicolor printing on a single-color press requires that the sheet be fed through the press as many times as there are colors to be printed. After each printing, the just used plate is removed and the inking system is thoroughly cleaned. A new plate is mounted on the plate cylinder, and the inking system is filled with the next color. The sheet of paper is run through the press again and printed with this new color. (Multicolor printing on a single-color press is dependent upon dry trapping -the ability of a dry, printed ink film to accept a wet ink film over it. The wet ink dries by oxidation (or) polymerization).



b) Multi color Sheetfed presses:



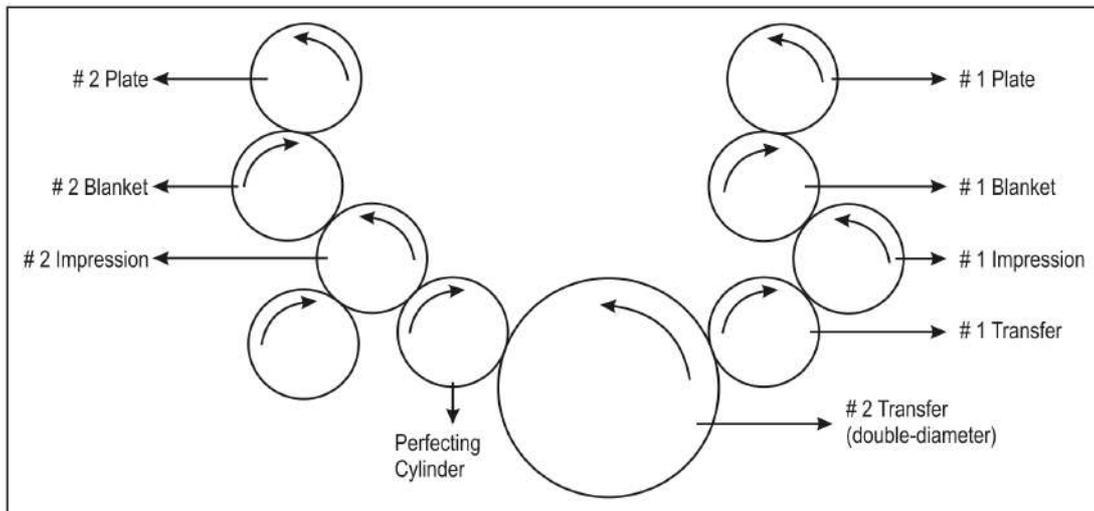
A press consisting of several printing units (each with its own inking and dampening system), a feeder, a sheet transfer system, and a delivery is called a multicolor or multiunit press. A multicolor press can have two, four, five, six, or more printing units. (Multicolor presses are capable of wet trapping, the ability of a wet, printed ink film to accept another wet ink film printed over it).

In the larger press sizes, the printing units are almost identical and are arranged in tandem. With some of the other two-and four-color presses, one printing unit may be higher than the other to obtain better accessibility.

When placed in tandem, the open-unit type of single-color sheetfed press becomes a multicolor press, capable of printing a different color on each unit. One or more transfer cylinders are placed between units to transport the sheet from one printing unit to the next. Some presses have three transfer cylinders between units, while other presses have a single, double-size transfer cylinder. An odd number of transfer cylinders are needed between units so that the side of the sheet to be printed faces away from the impression cylinder.

1.3.3 Convertible press

These presses are used to print in both sides of the paper in a single pass from the feeding unit to the delivery unit. In this press two or more printing units are present. After printing the first unit the paper gets turned to the next side by using special transfer cylinder for printing in the next side of the paper by the second printing unit. Thus the paper gets printed at both sides in the printing units. This is also one kind of perfecting press. This press may also be used as the normal offset machine for printing all the colors in one side of the paper also.



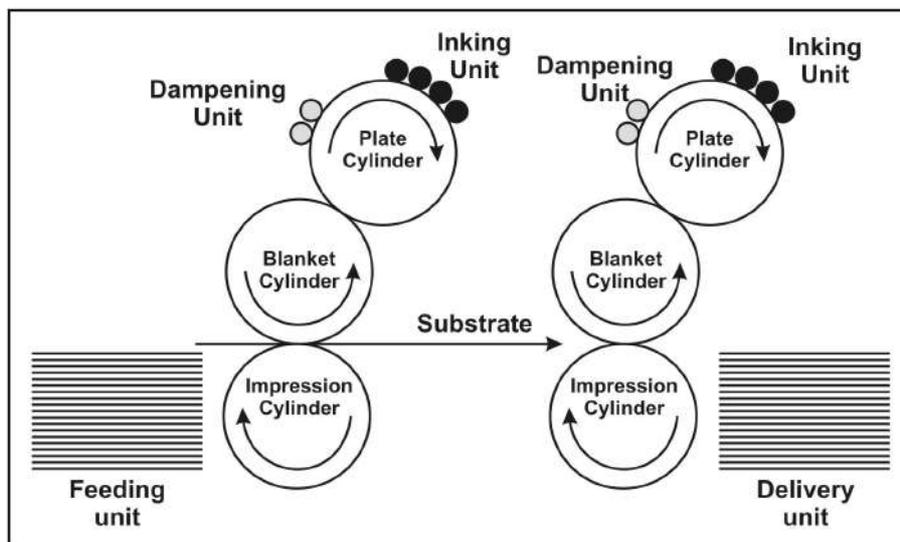
1.4 TYPES OF SHEETFED OFFSET PRESS:

There are three types of sheetfed offset machine are present. They are

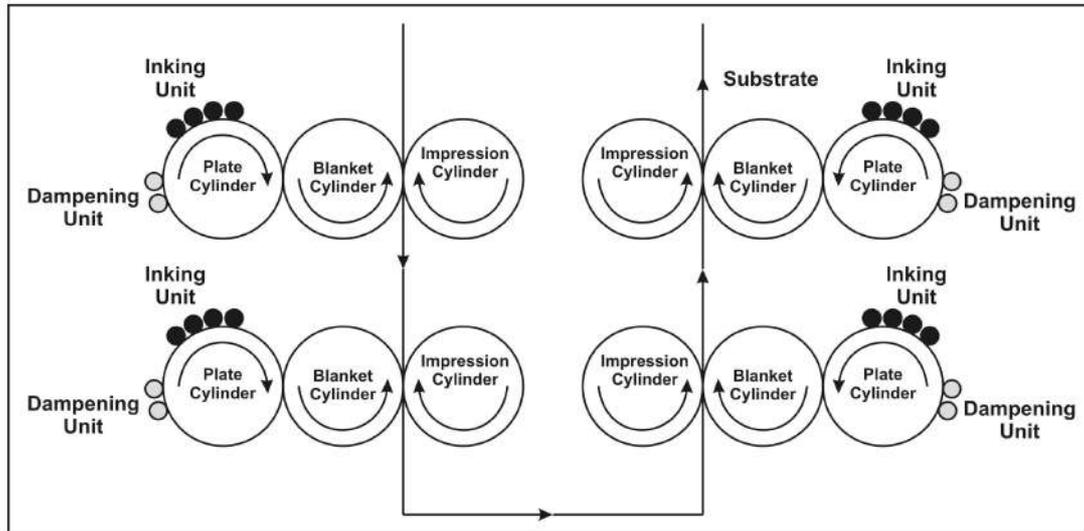
- Inline press
- Stack Type press
- Blanket to Blanket Press
- Common Impression Cylinder press.

a) *Inline press:*

This is the press in which all the printing units are arranged one after the other in a line. So the presses are called as the Inline presses. This Inline presses are non-perfecting type. Because each unit only one Plate cylinder, Blanket cylinder and Impression cylinder. These presses occupies more space.



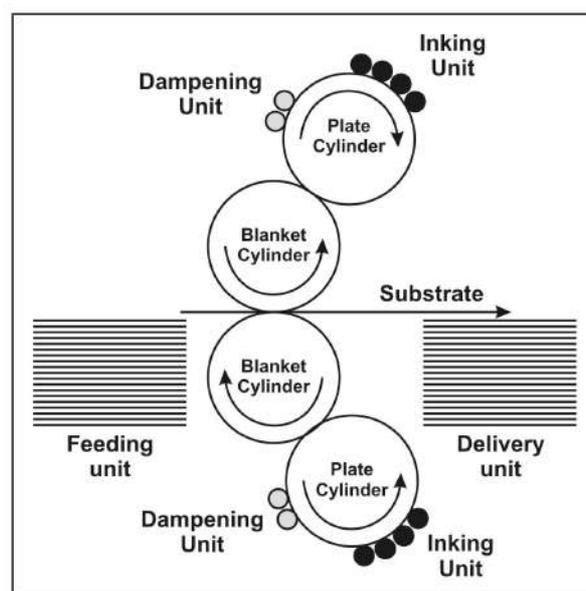
b) Stack Type Press:



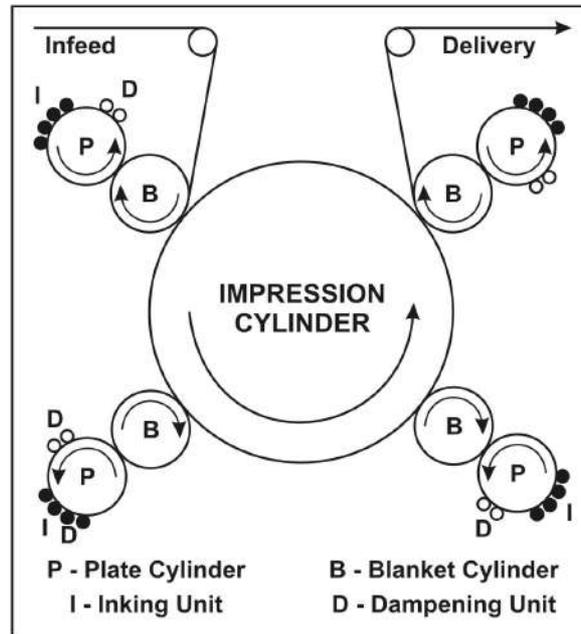
In this presses each printing unit is arranged vertically one over the other. In this presses the printing units are arranged horizontally and the paper goes to vertically printing. This type of presses occupies less space because the printing units are arranged one on the top of the other.

c) Blanket to Blanket Press

In this presses no impression cylinder is present. In each unit only blanket and plate cylinder is present. In this presses the blanket cylinder of unit acts as impression cylinder to give impression to the blanket cylinder of the next printing unit. These presses are otherwise called perfecting presses. In single pass of the paper, the paper gets printed at both sides. These presses save time of production.



d) Common Impression Cylinder presses:



In this type of press a large size of impression cylinder is present. Around the impression cylinder two or more printing couples are arranged. The paper gets fed from one side of the impression cylinder to the first printing unit and gets delivered from the last printing unit in the other side of the common impression cylinder. If the CIC presses consist of four or more than printing units around in its surface then this presses are called as satellite presses. If two printing units are arranged around a CIC presses then this presses are called as semi-drum presses. The other name of the CIC presses the four printing units or more then this press is called as satellite press.

QUESTIONS

Unit - I

PART – A (Two Marks Questions)

1. What is the meaning of offset?

The ink printing over the paper surface gets off into blanket from plate cylinder and finally set on paper. (Plate → Blanket → Paper)

2. What are the structures of sheetfed press? or What are the configurations of sheetfed offset press?

1. Single color sheetfed press.
2. Multicolor sheetfed press.
3. Perfecting press.

3. What is perfecting?

Printing on both sides of the paper in a single pass is called perfecting.

4. State the purpose of Inking unit?

Inking unit is to supply a very thin amount of ink to the plate for printing.

5. What is an Inline press?

In this press all the printing units are arranged in a line.

6. What is stack type press?

In this press the printing units are arranged one over the other.

7. What is CIC press?

In this press a large size common impression cylinder is present for giving pressure to the printing units present around the common impression cylinder.

8. What is the other name of CIC press?

Satellite press.

9. What is semi-drum press?

This is the press in which only two printing units are arranged around the CIC.

10. What is single color offset machine?

Single colour offset machine is capable of printing single colour in one pass. It has one set of Plate cylinder, Blanket cylinder, Impression cylinder with Inking and Dampening system.

11. What are the units of offset press?

1. Feeding unit.

2. Printing unit.
3. Inking unit.
4. Dampening unit
5. Delivery unit.

12. What is a printing couple?

In each printing couple a Plate cylinder, Blanket cylinder and Impression cylinder along with an Inking system and Dampening system is present.

13. What is the use of Plate cylinder?

The Plate cylinder is used to hold the plate (image carrier) for printing.

14. What is Blanket cylinder?

The Blanket cylinder is used to hold the resilient blanket for printing.

15. 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.

16. What is an image carrier?

Image carrier holds the image over the surface to transfer the ink from its surface to the paper.

PART – B (Three Marks Questions)

1. What is Oleophilic and Hydrophilic?

Oleophilic means oil receptiveness of a material. Hydrophilic means water receptiveness of a material.

2. What is the use of feeding unit and what are the types of sheetfed press?

Feeding unit is used to feed the paper one after another for printing.

1. Inline press.
2. Stack Type press.
3. Blanket to blanket press.
4. Common Impression Cylinder press.

3. What is multi color offset press?

Multi colour press is capable of printing multi colour. It has two or four or more set of Plate cylinder, Blanket cylinder, Impression cylinder with Inking and Dampening system to print multi colour in single pass.

4. What is the use of transfer cylinder?

Transfer cylinder is present between two printing units which are used to transfer the printed sheet from the first unit to the next unit.

5. What is convertible offset press?

These presses are used to print in both sides of the paper in a single pass from the feeding unit to the delivery unit. In this press two or more printing units are present. After printing the first unit the paper gets turned to the next side by using special transfer cylinder for printing in the next side of the paper by the second printing unit. Thus the paper gets printed at both sides in the printing units.

PART – C (Ten Marks Questions)

1. Explain the units of offset printing with neat sketch.
2. Explain the construction of sheetfed press with neat sketch?
3. Explain the configuration (or) structure of sheetfed- offset presses with neat sketches?
4. What are the types of offset presses? And explain any one with neat sketch.
5. Explain the working principle of single colour offset press with neat sketch.
6. Explain the working principle of multi colour offset press with neat sketch.
7. Explain the working principle of convertible offset press with neat sketch.
8. Explain the working principle of inline offset press with neat sketch.
9. Explain the working principle of stack type offset press with neat sketch.
10. Explain the working principle of blanket to blanket offset press with neat sketch.
11. Explain the working principle of common impression cylinder offset press with neat sketch.

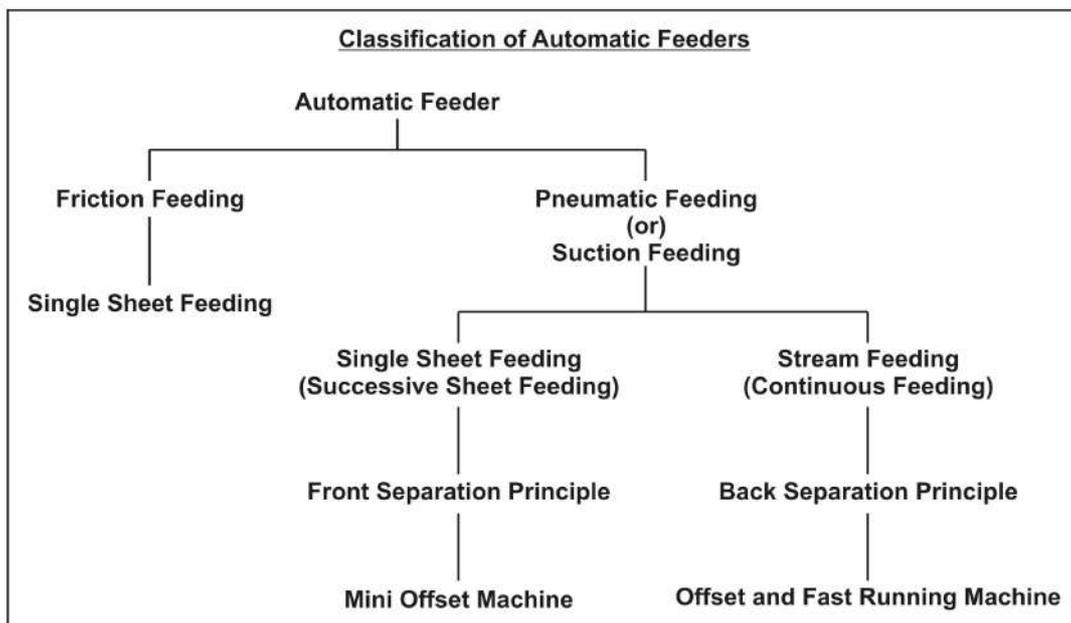
UNIT- II

2. SHEET CONTROL AND DELIVERY IN OFFSET PRESS

Sheet control means separating the sheet from the pile board and transporting the sheet one by one into the printing unit in correct print registration. The sheet control devices are blowers, suckers, infeed wheels, brush wheels, metal wheels, rubber wheels, side lay, front lay and infeed wheels.

2.1 Types of Feeders

1. Friction feeders
2. Suction feeders (Single sheet feeder and Stream)



Automatic sheet feeder are the feeders which automatically separate the sheets from the pile board and transfer the sheets into the printing unit. *The automatic feeders are classified into friction feeder and suction feeder.*

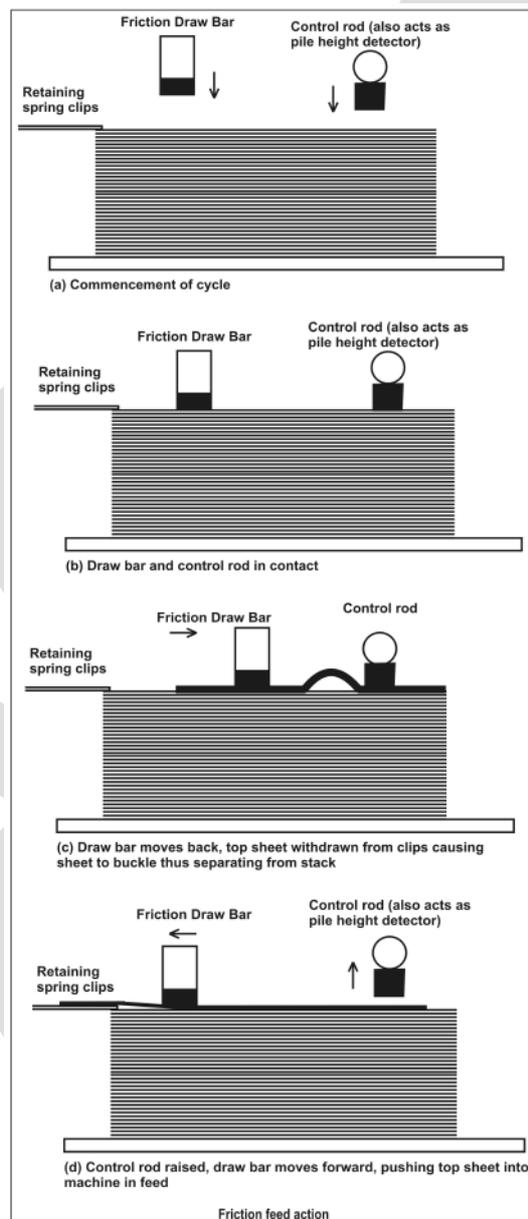
2.1.1 Friction feeder:

Friction feeder feeds the sheets one by one by means of friction devices. Friction feeding is mainly used in small offset duplicators. This is also used in folding machines.

In the friction feeder there is a set of retaining spring clips. These clips catch the front or leading edge of the pile of paper. This finger avoids the passing of more than one sheet into the machine. The friction draw bar and control rod also present in these feeders. The control rod is also acts as the pile height governor. The friction draw bar and control rod are involved in feeding the paper into the machine.

Offset Printing Technology

First the friction draw bar and control rod both moves downwards and presses the top of the pile. The control rod remains in its place but the friction draw bar moves towards the control rod by releasing the topmost sheet of the pile from the retaining clips. At the same time as the control rod is stationary, a buckle will be formed in the sheet. So, only one sheet will be separated due to the buckle forms. Now the control rod moves upwards to its original position. But the friction draw bar moves towards the retaining clips thus moving the separated sheet over the clips. The friction draw bar will move until the leading edge of the sheet is inserted into the nip of the forwarding rollers. Then the friction draw bar will moves to its original position for the next cycle.



The metal strips are used in the feeder head which are used to avoid the passing of double sheet going for printing during sheet separation.

2.1.2 Types of Suction or Pneumatic Feeder:

This type of feeders is operated with the help of air supply. The suction or pneumatic feeders are divided into two types:

1. Single sheet feeder or Successive sheet feeder
2. Stream feeder or Continuous feeder.

Types of Automatic feeder

The automatic feeders are divided into types,

1. Single sheet feeder or Successive sheet feeder
2. Stream feeder or Continuous feeder.

2.1.3 Single sheet feeder or Successive sheet feeder:

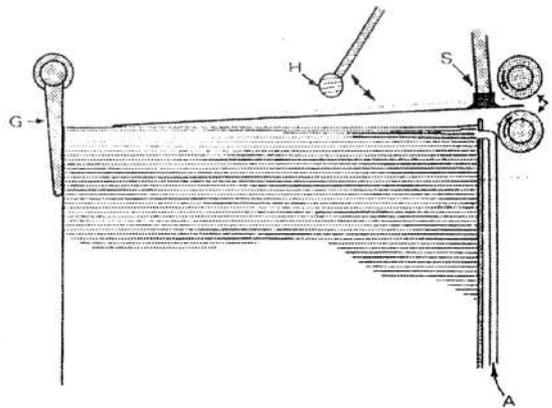
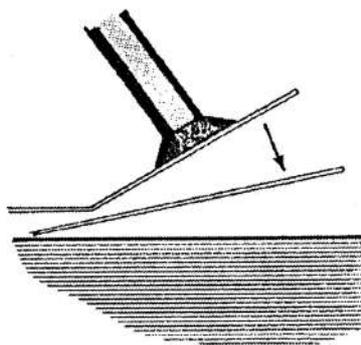
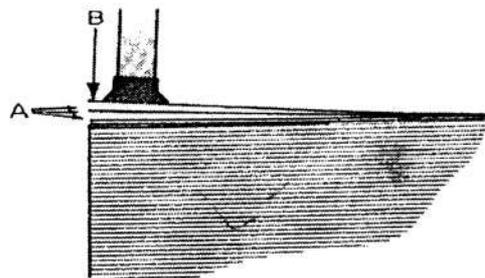


Fig. 110.—The single-sheet feeder. A—air blast, G—pile guide, H—pile-height governor, S—suckers, F—forwarding rollers.



Sucker tilt to separate double sheets.



Sucker contact with the top sheet without forcing the sheet back to the pile. A—air blast, B—lowest point of sucker.

This feeder is present in the machine which is working with front separation principle. The speed of the front separation machine is slow when compared to the speed of

the back separation machine, because in front separation machine the sheet has to be waiting for sometime to allow the full sheet to cross the front separation suckers. Example for front separation machine is mini offset machine.

The working sequence of single sheet feeder is as follows:

1. The pile height governor senses the height of the pile and automatically raises it to predetermined position.
2. The air nozzles situated at the front and rear side's forces the air into the top pile partially separating them.
3. The front suckers descend and take hold of the first sheet.
4. The forwarding suckers lift and the sheet is moved forward suckers until the leading edge of the sheet is between the rollers.
5. The forwarding rollers close on to the sheet and it is conveyed to the feed board.

The single sheet feeder is generally found on smaller presses which run about the speed of about 6000 IPH.

2.1.4 Stream Feeder:

These types of feeders are present in the machine which is operated by back separation principle.

The speed of the stream feeder machine is high when compared to the speed of single sheet feeding machine because the feeder head is present at the back edge of the paper present in the pile board. So the suckers do not able to wait for the full sheet passing. The stream feeders are present in the general offset machines as well as high speed machines.

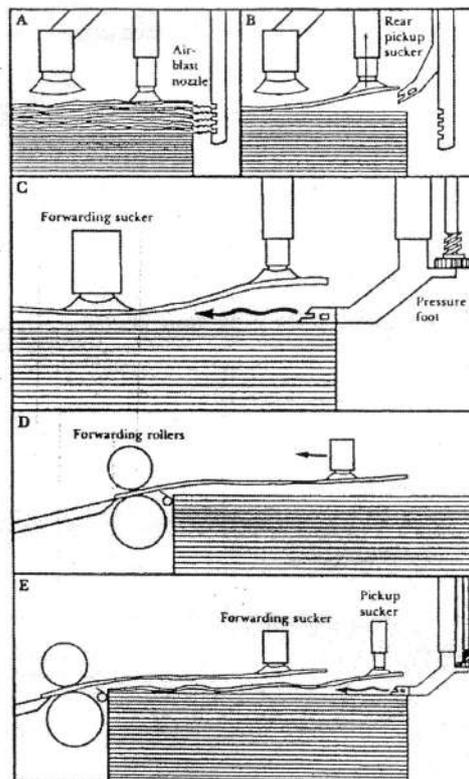
The sequence of operation of stream feeder is as follows:

1. Air is forced into the back edge of the pile separating the top sheets. The rear suckers descend and take hold of the top floating sheet.
2. The sucker's raises the back edge of the sheet and the hold down foot descends to firmly hold the remaining sheets to the pole. This hold downfoot often acts as the pile height governor.
3. A steam of high velocity air is now directed under the top sheet, lifting the front edge to level with the forwarding rollers.
4. The sheet is now moved forward by cushion of air to pass between the forwarding rollers and the drop wheels which close on to the sheet and convey to forward. As the sheet is taken by the forwarding roller, the back separation unit begins its next cycle.

2.2 Feeder head components:

This is the part of the feeding unit present above the pile board. It consists of the components which are used to separate and to forward the sheets one by one for printing. The feeder head components are:

- a. Air blast nozzles
- b. Rear pickup suckers (Lifting Suckers)
- c. Forwarding pick up suckers (Forwarding suckers)
- d. Lifting and forwarding suckers or Rear pick up and forwarding suckers
- e. Brushes
- f. Metal strips or metal fingers or sheet separation strips
- g. Sheet steadiers



Principle of sheet separation on a stream feeder

Feeder head components:

The devices which are present in the feeder head are called feeder components. The feeder head components are air blast nozzles, rear pickup suckers, sheet steadiers, separation brushes and fingers.

1. Air blast nozzles :

This component is present at the feeder head and used to blow forced air at the back edge of the pile board where the pile of paper is present. The air lifts the paper at the back edge which helps for the separation of single sheet for printing.

2. Rear pickup suckers (Lifting Suckers):

This is the suckers present in the machine which works by back separation principle. This sucker sucks the air to separate the sheets in the pile board at the back edge. The other name of the rear pick up suckers is called lifting suckers.

3. Forwarding pick up suckers (Forwarding suckers):

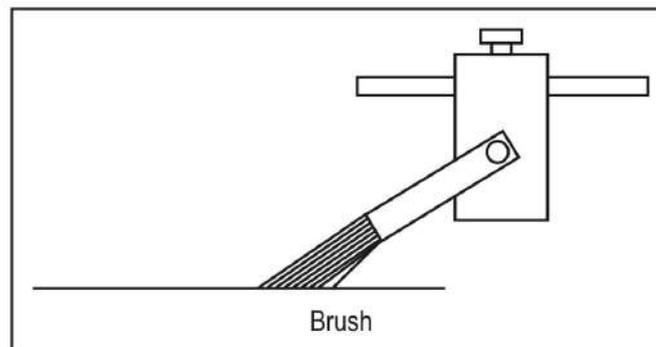
These are the suckers present after the rear pick up suckers which receives the paper from the lifting suckers and forward the received sheets one after one over the feed board area.

4. Lifting and forwarding suckers or Rear pick up and forwarding suckers:

These suckers are also present at the back edge of the paper at the pile board. These suckers perform both the lifting and forwarding operations on the paper. So these suckers are called as lifting and forwarding suckers.

5. Brushes:

The brushes are used in the feeder head which are used to avoid the passing of double sheet for printing during sheet separation operation. The bristles of the brushes enter into the lifted papers and help to avoid the suction of double sheets for printing.



6. Metal strips or metal fingers or sheet separation strips:

These are the flexible metal fingers which contacts the back edge of the pile of paper. These strips are used to avoid the passage of double sheets going for printing.

Sheet Steadiers:

The sheet steadiers are present in the feeder head and it is provided in a manner that its flat edge contacts in the two side edges and rear edge of the stacked paper to avoid the displacement of paper during lifting and forwarding operation. These sheet steadiers are having up and down movement.

Sheet forwarding devices:

These are the devices which are used to transport the sheets one by one from the pile board area over the feed board to the front lay for registration. The forwarding suckers are given as follows:

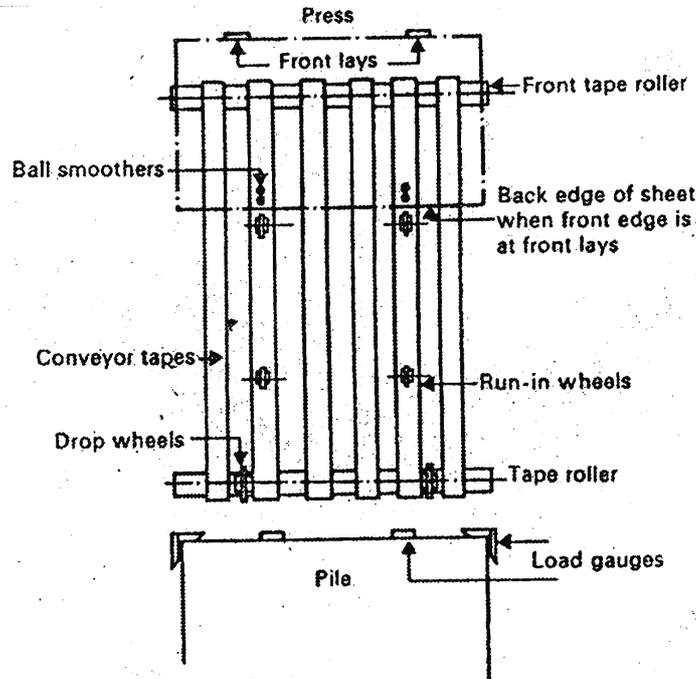


Fig. 168. Feed-board layout.

1. Forwarding suckers:

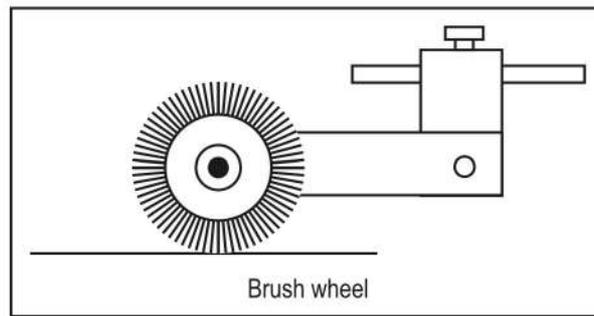
These suckers receive the sheet from the lifting suckers and forward the received sheets into the feed board.

2. Conveyor tapes:

These endless belts are made of hard-wear material. They are connected with the shaft at the front and back edge of the feed board. They are present in correct tension for helping the tensioning rollers for free movement.

3. Running-in wheels (Brush wheels):

These wheels must be positioned over the conveyor tape and tensioned for giving correct pressure to the sheets for movement over the feed board.

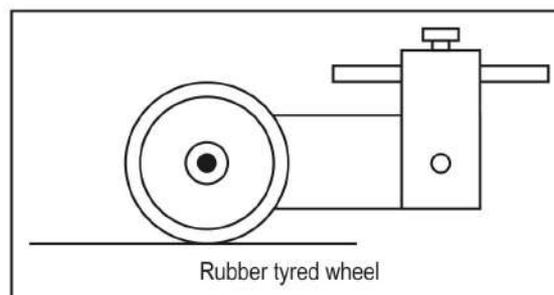
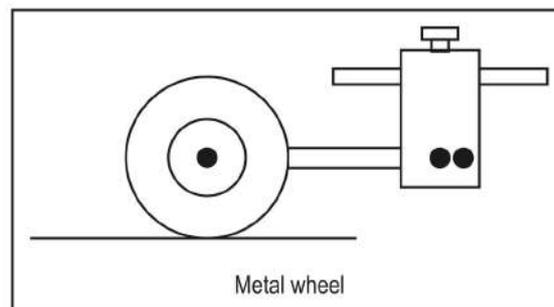


4. Conveyor assemblies:

Two or more feed board rails are situated over the feed board. The Running in wheels, brush wheels and ball assemblies are attached to the rails by movable clamps.

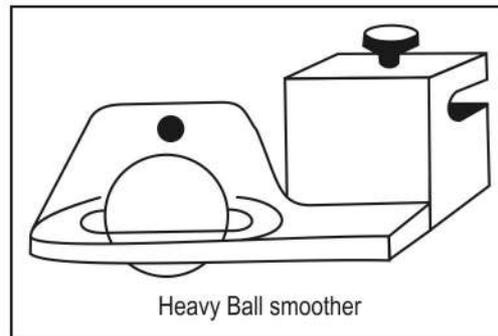
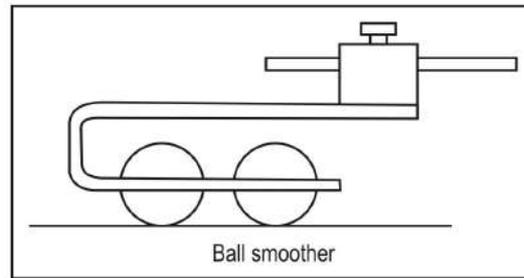
5. Forwarding rollers(metal wheel or rubber type wheel):

These rollers are present over the rotating shaft. These are used to transport the sheets from the pile board to the feed board.



6. Ball Smoothners:

Ball smoothners are positioned over the conveyor tape to hold the paper on the feedboard firmly. Ball smoothners rotates at 360° angle which allows the paper to move front and side ways.



3.3 Sheet registering devices:

These are the devices present in the feed board which is used to register the sheets in the front and side edges to pass the sheet in a square for the correct positioning of image on the sheets.

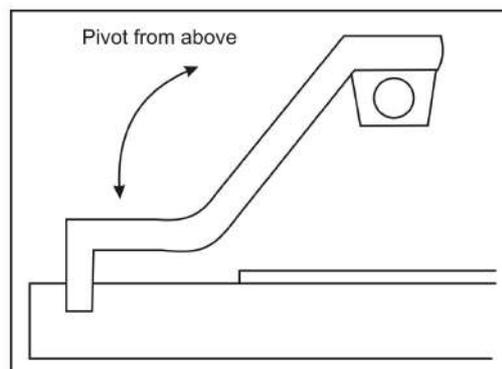
The sheet registering devices are classified into front lays and side lays.

a. Front lays:

These lays are present at the last edge of the feed board to register the paper front edge. These front lays are used to register the front edge of the unprinted sheets without any cross. The front lays are divided into two types,

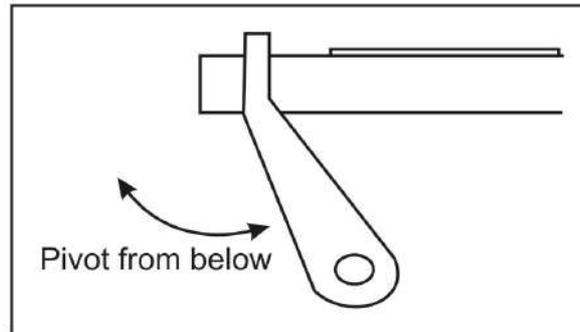
1. Pivoted above from the feed board and
2. Pivoted below from the feed board.

1. Pivoted above from the feed board



This type of front lays is present above the feed board and it Contact the feed board edge during the time of paper comes to the feed board edge for front registration. This is connected with the mechanism present above the feed board.

2. Pivoted below from the feed board



This type of front lays is present below the feed board and it Contact the feed board edge during the time of paper comes to the feed board edge for front registration. This is connected with the mechanism present below the feed board.

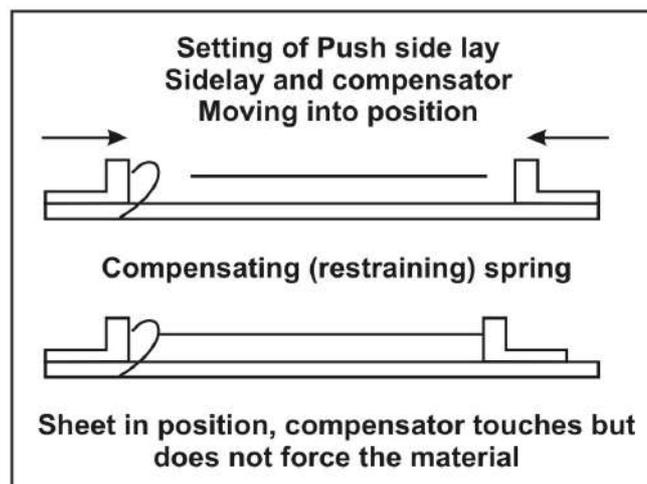
b. Side lays:

Side lays are used for the side registration of the paper before printing. The side lays are present at the side of the feed board area. There are two types of side lays are present, they are,

- a. Push type side lay and
- b. Pull type side lay.

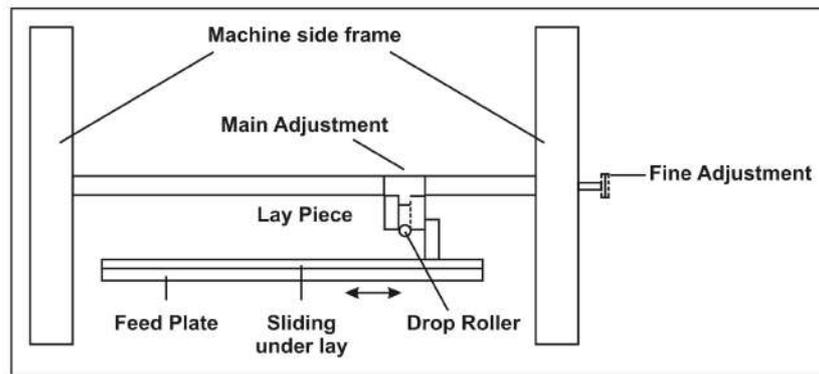
a. Push type side lay:

This type of side lays registers the paper side edge by means of paper Pushing principle. This type of side lays are present in slow running and mini offset machine.



In this type a compensator mechanism and a side lay having to and fro movement is present. When the paper comes for side registration the compensator pushes the paper towards the side lay and due to the movement of side lay and compensator mechanism the paper gets registered at the side edges.

b. *Pull type side lay:*



This type of side lays registers the sheet at the side edge by means of paper pulling principle.

This side lay consists of a sliding bar or sliding under lay which has to and from movement over the feed board. A roller mechanism is also present over the sliding under lay. Due to the movement of the sliding under lay and roller mechanism, paper side edge gets registered at the side piece.

Detectors:

The detectors are used to detect either early or late arrival of paper in the machine. There are three types of detectors and they are:

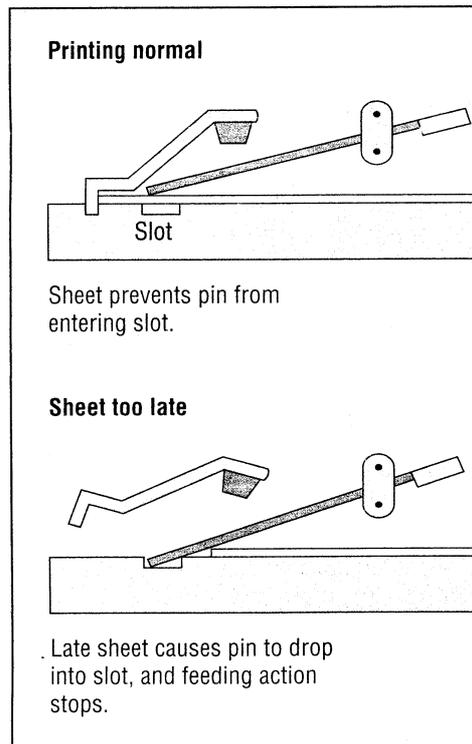
- a. Double sheet detectors
- b. No sheet detectors (Early and late sheet detectors)
- c. Cross sheet detectors

No Sheet Detector (Early and Late sheet detectors):

Most presses have a device that detects either the early or late arrival of sheets at the front guides. Four basic types of sheet detectors are used:

Late Sheet Detectors (or) Mechanical type Sheet Detectors:

Mechanical

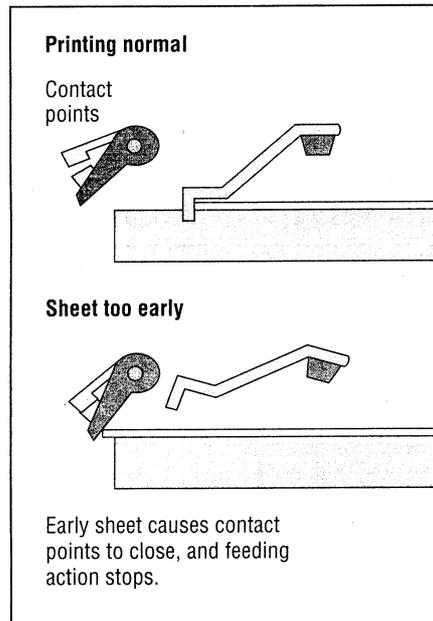


The detector which detects the late sheet are called Mechanical sheet detectors. A sheet reaching the front guides at the proper time prevents a pin from entering a slot in the feedboard. However, if the sheet is late reaching the front guide, the pin drops into the slot, and the feeding action of the press stops. A mechanical sheet detector is easily damaged due to the paper-caused wear or poor adjustment.

Early Sheet Detectors (or) Electromechanical type Sheet Detectors:

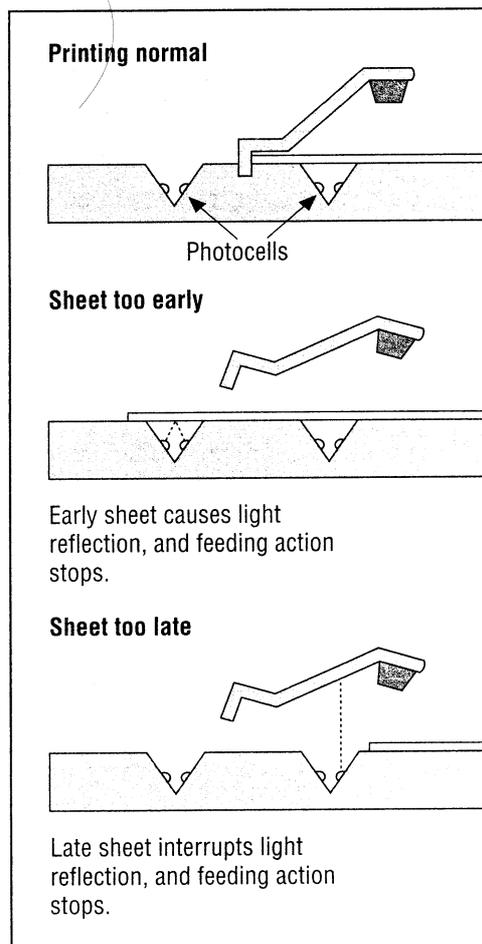
The detector which detects the early sheet are called ElectroMechanical sheet detectors. The electromechanical sheet detector consists of normally open electrical contacts. A sheet arriving too early at the front guides causes the contact points to close, and the feeding action stops. An electromechanical sheet detector is also easily damaged due to paper-caused wear on poor adjustment.

Electromechanical



Photoelectric type:

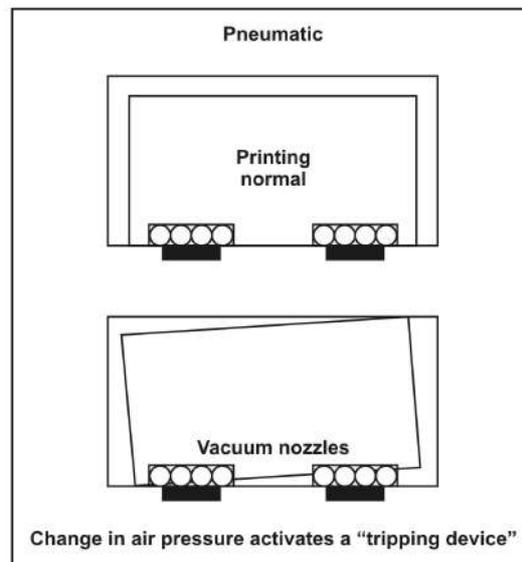
Photoelectric



Offset Printing Technology

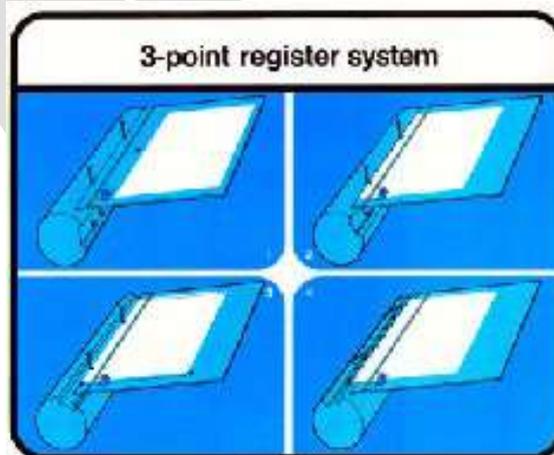
The detector which detects the early and late sheet are called Photoelectric type. This type of detector consists of two photocells, one to detect early sheets and one to detect late sheets. Each photocell is paired with a lamp that does not shine on the photocell. If the front guides are up, an early sheet reflects light from the lamp of the “early detector” to its photocell, stopping press rotation and feeder operation. If the front guides are down and the sheet is late, no light reflects from the lamp of the “late detector” to its photocell, stopping feeding action. The operation of each photocell is timed to the position of the front guides. To operate properly, the photocells must be kept clean.

Pneumatic type:



Which detects the sheet located improperly at the front guide. Consisting of a series of vacuum nozzles, the device detects an improperly located sheet whenever air pressure changes. A change in air pressure activates a tripping device that stops feeding action. Porous stock may cause false detection.

Three point register system:



The registration of the paper over the feed board in a way that the edges contact one point at the side lay and two points at the front lay. This three point registration allows paper correct registration during printing.

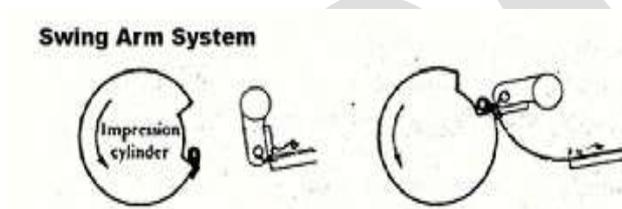
2.4 Sheet insertion devices:

These are the devices which inserts the sheets one by one into the printing unit.

The in feed grippers are used as the sheet insertion devices in the sheet fed offset machine.

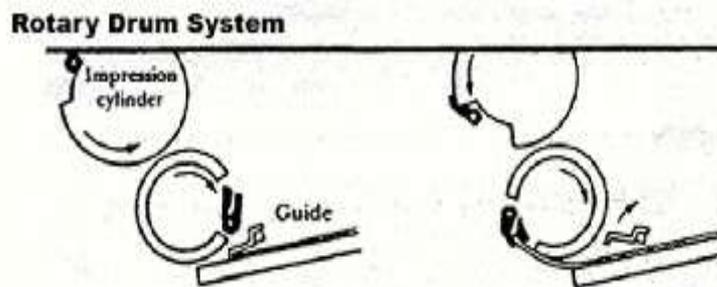
1. Swing arm gripper system:

These grippers rotate at an angle of 90 to grip the registered sheet the front lay. These grippers movement is 90 at forward and backward for opening and closing the mouth for gripping the and to give sheet to the impression cylinder grippers for printing.

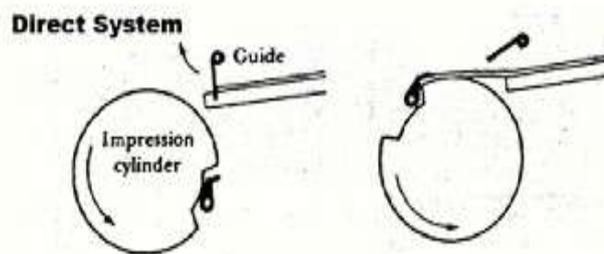


2. Rotary gripper:

In this system the gripper rotates continuously at an angle of 360 to grip the registered sheet at the front lay. These grippers rotate continuously in one direction for gripping the sheet from the front lay and to give the paper edge to the impression cylinders.



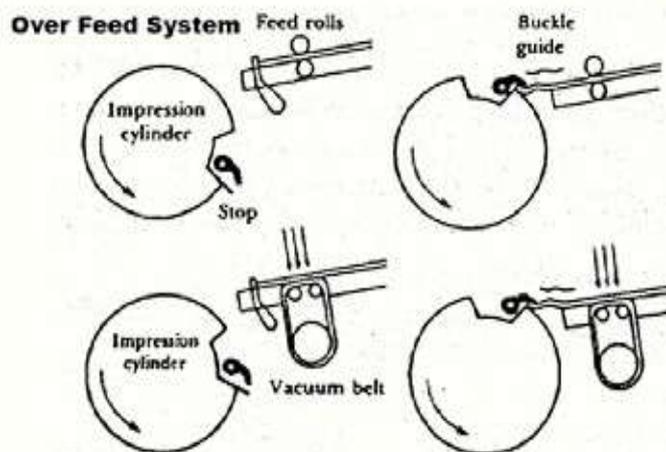
3. Tumbler gripper system:



In this system the gripper rotates at an angle of 180 for gripping the sheet at the front lay. After gripping the sheet it again rotates 180 angle in reverse for giving the gripped paper leading edge into the impression cylinder gripper. For the 180 angle rotation the gripper is activated by means of a gripper mechanism.

4. Overfeed system:

In this system two rotating rollers are present before the front lay. After the sheet registered at the front and side lays, due to the rotation of the rollers the sheets directly gets inserted into the grippers of the impression cylinder.

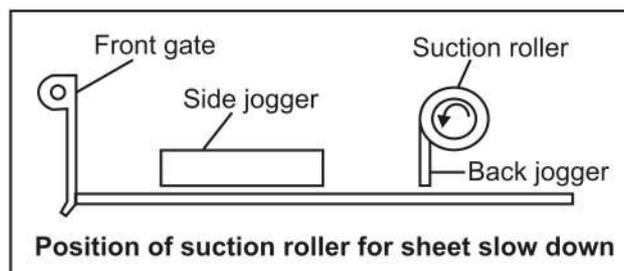


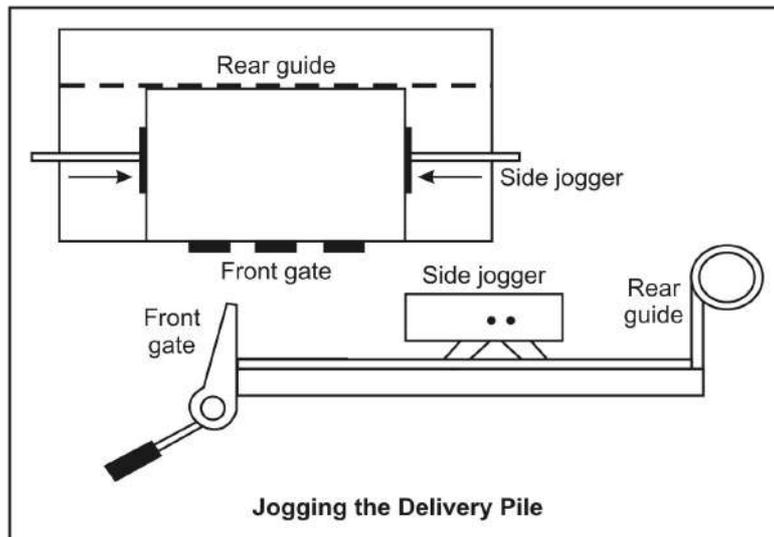
2.5 DELIVERY SECTION :

The delivery is present after the last impression cylinder. This section is used for the proper delivery of the printed sheet one over the other. The delivery section consists of delivery grippers which receive the printed sheets from the impression cylinder and stack the sheets one over the other.

Jogging the Delivery Pile:

Jogging means the proper alignment of the sheets evenly one over the other. For jogging the printed paper at the delivery pile board front joggles, rear joggles, (movable) and side joggles are used (movable) are used. When the delivery grippers drop the sheets over the pile board, these joggles align the sheets evenly.





These are the devices which are used for stacking the printed paper neatly in the delivery pile board. The delivery assist devices are as follows,

1. Suction Slow Down Rollers:

Suction slow down and steady the sheets as it enters the delivery. They are usually positioned just behind the chain delivery. These rollers are connected with vacuum motor. These rollers have holes by which the sheets got sucked by air suction principle. Due to this suction the sheet delivery is steady and slow over the delivery pile board.

2. Blow Downs:

Near the top of the delivery a shaft with series of holes is present. These Shaft is connected with air motor. The air is blown over the top of the sheet when the printed sheet got entered into the pile board area of the delivery section.

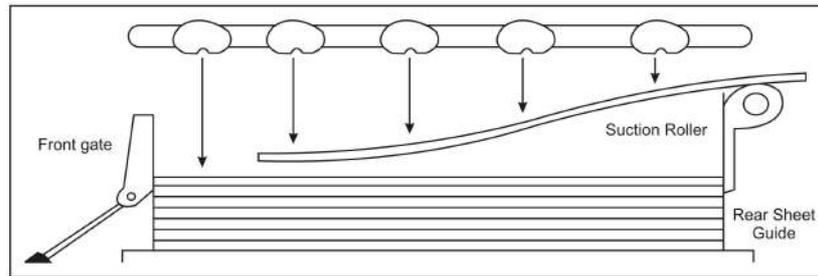
Set – Off:

This is the problem caused due to the formation of wet ink of the first printed sheet at the back side of the second printed sheets.

To avoid this problem anti set off devices are used.

Anti-Set Off Devices:

These are the devices present at the delivery pile area which applies anti set off components over the printed sheets. These components form a layer over the printed wet ink and avoid the set off problem. Anti-set off devices is of two types and they are,



1. Powder Sprayer:

These sprayer sprays the powder form of anti set off component over the Printed sheet. These types of sprayers are used only in single color offset machines because the powder does not create any problem while printing multi colors by using the single color offset machines.

2. Liquid Sprayer:

These sprayers spray liquid anti set off component over the printed sheet.

The liquid sprayers are only used in multi color machines which completely prints all colors over the sheet in one pass. These sprayers are not used in multi color machines because if we spray liquid on the printed sheet and if we use the printed sheet for next color printing, we could not get the correct color results because the liquid layer avoids the correct merging and correct color formation.

Wedges:

Wooden or plastic wedges are used to produce a neat pile. The wedges can be inserted at the trailing or tail edge of the sheets. These wedges helps to counter tail -end hook (a sharp curl) at the back edge of the sheets.

Makeready Operation:

The setting of a previous job should be reset for printing a new job. The inking system should be washed. The dampening rollers may be cleaned if needed. The plate should be removed and taken for storage.

Makeready Steps:

1. Prepare the press for new press run.
2. Check copy, plates, paper, and ink against instructions.
3. Set sheet handling mechanisms.
4. Pack and mount the plates.
5. Check and prepare new blanket (necessary)
6. Prepare the dampening system.
7. Prepare the inking system.

8. Prepare the makeready books for pile (1:5)
9. Make trial impression.
10. Examine trial impression.
11. Make necessary adjustments to image position/ register impression quality and color.
12. Obtain a color and position OK.

Makeready Procedure for Single Color Printing:

Checking Copy, Plate, Ink and Paper against instructions:

The Original given for printing is taken and it is observed. Then the images in the plate have to be checked for perfection. The quantity of the paper and the quality of paper also checked for fine printing to give quality results.

Setting the Sheet Handling Mechanism:

Sheet handling mechanisms starts from pileboard to frontlay. In the pileboard the side guides, front stoppers and feederhead are set according to the sheet size. The double sheet detector must be set according to the stock thickness. The feederboard elements and sidelays are set according to the size of the stock. These sheet handling mechanisms must be set properly in order to transport the sheets into the printing unit without any stops. The delivery joggers also set according to the paper size for neat stacking of printed papers.

Packing and Mounting the Plate:

The plate used for printing the job should be taken and its thickness must be measured. According to the plate thickness the required thickness of packing sheet is taken and is placed between the plate cylinder and the plate during the mounting of the plate. The thickness of the plate and packing is considered according to the undercut of the plate cylinder.

Checking and Preparing the New Blanket (If Possible):

During makeready of the machine the condition of the blanket must be checked. If the blanket surface is not in good condition or any unrectified low spots are to be found then the blanket is removed from the cylinder and new blanket is mounted with correct packing.

Preparing the Dampening System:

The dampening roller cloth covers are washed to remove the ink particle accumulation. If any cloth covers got damaged then they should be replaced by a new. The after these rollers are mounted in the dampening unit. After that the dampening solution is prepared with correct pH level and the prepared solution is poured in the dampening duct.

Preparing the Inking System:

The inking system rollers must be cleaned to remove the previous job printed ink. Then the ink to be printed into the ink duct. Then the ink keys are adjusted for supplying the ink from the ink duct to the duct roller according to the image present in the plate.

Preparing the Makeready Books:

During makeready of job a number of sheets are required to be printed. If we use unprinted sheets then a number of sheets has to be wasted during makeready. To avoid the wastage of white sheets the makeready books are prepared. The makeready books are prepared by placing 5 waste sheets to 1 unprinted sheet (5:1 ratio). This books avoids unprinted sheet wastage.

Making Trial Impression:

After the makeready book was prepared a trial impression was made in the unprinted paper by passing the makeready book into the printing unit.

Examining the Trial Impression:

From the delivery board the printed white sheet is taken and it is examined through for the registration of image, color density etc., if there is any mis registration (or) color value is found then required adjustments are made and the machine is run to get next trial impression.

Getting OK for Printing:

After all the adjustments are made and perfect result is obtained in the paper during the trial impression then the printed paper is taken to the supervisor or other higher authorities to get approval for printing.

Running the Machine:

After getting approval from the authorities the machine is run continuously to print the required number of copies.

Safety Precautions:

1. Observe all the rules and regulations mentioned in the machine manual.
2. Never make major repairs or perform maintenance when the machine is running. Any work or minor service and maintenance should be done only after the power is locked out.
3. Never wear loose clothes and hand jewels near to the running machine that will lead to accidents.
4. Before touching the running parts of the machine make sure the press is completely stopped.
5. Never switch off or bypass the safety devices.
6. Wear hearing protection devices when working in areas with high noise level.

7. Never lean or rest hands on running machine.
8. Avoid carrying tools in pockets to prevent the possibility of dropping into the machine which lead for dampening the machine parts.
9. Do not allow oil, grease, dirt and paper scarps to accumulate on the floors around or break equipment.
10. Do not smoke in the press run.
11. Always wear personal protection equipment where necessary or instructed to protect against personal injury.
12. Check the all guards, covers are completely locked in place before operating the press.

AGPC

QUESTIONS

UNIT – II

PART – A (2 Marks Question)

1. What are the classifications of automatic feeders?

Friction Feeding, Pneumatic Feeding

2. What are the types of pneumatic feeders?

Single sheet Feeding, Stream Feeding.

3. What is the other name for single sheet feeder?

The other name for single sheet feeder is successive feeder.

4. What is the other name for stream feeder?

The other name for stream feeder is Continuous feeder.

5. What are the sheet registering devices?

Side lay and Front Lay

6. What are the two types of front lays?

1. Pivot above from feed board
2. Pivot below from the feed board

7. What are the uses of front lays?

Front lays are used to register the front edge of the unprinted sheets without any cross.

8. What are the types of side lay?

Push type side lay and pull type side lay.

9. What is a side lay?

Side lay are used for the side registering of paper before printing. These are present at the side of the feed board area.

10. What are the delivery assist devices?

Suction slow down and blow down.

11. What are the feeder head components?

The Feeder head components are air blast nozzles rear pickup suckers, forwarding pickup suckers. Sheet steadiers, separate brushes and metal fingers.

12. What is the other name of rear pickup suckers?

Lifting suckers.

13. What is forwarding pickup suckers?

This are the suckers present after the rear pickup suckers which receives the paper from the lifting suckers and forward the received sheet one after one into the feed board area.

14. What is the other name of forwarding pickup suckers?

Forwarding Suckers.

15. What are separator brushes?

The brushes are used in the feeder head which are used to avoid the passing double sheet for printing during sheet separation operation.

16. What is metal finger?

The metal strips are used in the feeder head which are used to avoid the passing the double sheet for printing during sheet separation.

17. What are the types of suckers?

1. Forwarding suckers
2. Lifting Suckers
3. Lifting and Forwarding suckers.

18. What is the other name for sheet separation brushes?

Combers

19. What is the other name for metal fingers?

Metal Strips

20. What is sheet control?

Controlling the sheet from pile board up to the first printing unit.

21. What is Bosses?

These are the devices present over the feed board for control the transportation of sheet before the first printing unit.

22. What are sheet separation devices?

Air blast nozzles rear pickup suckers, forwarding pickup suckers. Sheet steadiers, separate brushes and metal fingers.

23. What are sheet control devices?

Side lay, front lay, metal roller, ball smoothness, moving belts. These are called as bosses.

24. Which type of feeder works on front separation principle?

Single sheet feeder.

25. Which type of feeders works on back separation principle?

Continuous sheet feeder

PART – B (Three Marks Questions)

1. What is three point register system?

The registration of the paper over the feed board in a way of paper edges contact two point at the front lay and one point at the side lay.

2. What is a friction feeder?

The Friction feeders are nothing but a roller mechanism is arranged at front edge of the paper stacked in the pile board. Due to the movement of the roller and its friction the paper gets fast into the printing unit.

3. What is lifting and forwarding suckers?

These suckers are also present at the back edge of the paper at the pile board. These suckers perform both the lifting and forwarding operation on the paper so this sucker is called Forwarding Suckers.

4. What are sheet steadiers?

The sheet steadiers are present in the feeder head and it is provided in a manner that its flat edge contacts in the two side edges and rear edge of the stacked paper to avoid the displacement of during lifting and forwarding operation. These sheets steadier are having up and down movement.

5. What is rear pick up suckers?

This is the suckers present in the machine works by back separation principle. This sucker sucks the air to separate the sheets in the pile board of back edge. The other name of the rear pickup suckers is called lifting suckers.

6. What is air blast nozzle?

This component is present at the feeder head and used to blow air forced at the back edge of the pile board where the paper pile is present. The air lifts the paper at the back edge which helps for the separation of single sheets for printing.

PART – C (Ten Marks Questions)

1. Explain the types of automatic feeders with neat sketch?
2. What are the sheet control devices? And explain them with neat sketch.
3. Explain the feeder head components with neat sketch?
4. Explain delivery assist devices with neat sketch?
5. Explain in detail about sidelay and front lay with neat sketch.
6. Explain about sheet insertion devices with neat sketch.
7. What are the make ready operation to be carried out in offset printing.
8. Explain in detail about pre-make ready and make ready operations.

UNIT - III : PRINTING UNIT IN OFFSET PRESS

3.1 CONSTRUCTION OF A SHEETFEED PRINTING PRESS

The printing units each contain a plate cylinder plus ink and damping rollers, a blanket cylinder and the impression cylinder. Each unit prints a single colour on only one side of the paper. In a four colour press, all four units are needed to build the multi-colour image on one side of the paper. There are also presses with more than four units, even up to eight units or more. An eight or twelve colour press can print both sides of the paper in one pass by means of a perfecting cylinder between the fourth and fifth or the sixth and seventh unit, which re-aligns the paper for the second side. Finally, the delivery system receives the sheets from the press and stacks them in a pile on the delivery board.

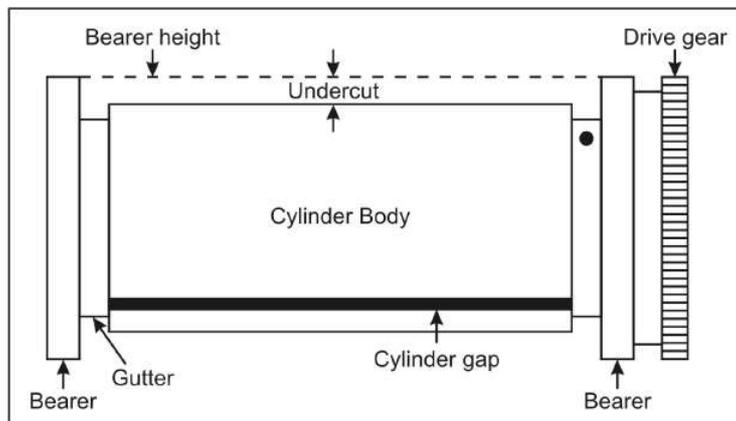
The Printing unit in the offset machine is used to transfer the inked image over the paper surface. The printing unit consists of the following parts:

1. Plate Cylinder
2. Blanket Cylinder
3. Impression Cylinder
4. Inking Unit
5. Dampening Unit

3.1.1 Plate Cylinder:

This Cylinder is used to hold the image carrier (plate) for printing. It consists of the following parts:

- a. Bearers
- b. Cylinder Body
- c. Gutter
- d. Undercut
- e. Gear, etc.



i. Bearers:

These are the smooth metal rings present at the extreme ends of the plate cylinder.

ii. Cylinder Body:

This is the area in which the plate has to be mounted. In this cylinder body a narrow gap is present. In this gap the plate locking devices are present. This gap is called as cylinder gap.

iii. Gutter:

This is the small groove present between the cylinder body and bearer. This groove is used to drain the washing chemicals from the plate surface.

iv. Undercut:

The exact height difference between the cylinder body to the bearer is called as Undercut. According to the undercut the plate thickness and packing thickness are calculated.

v. Gear:

The Gear is present at one side of the cylinder which is used to generate power for driving other cylinders.

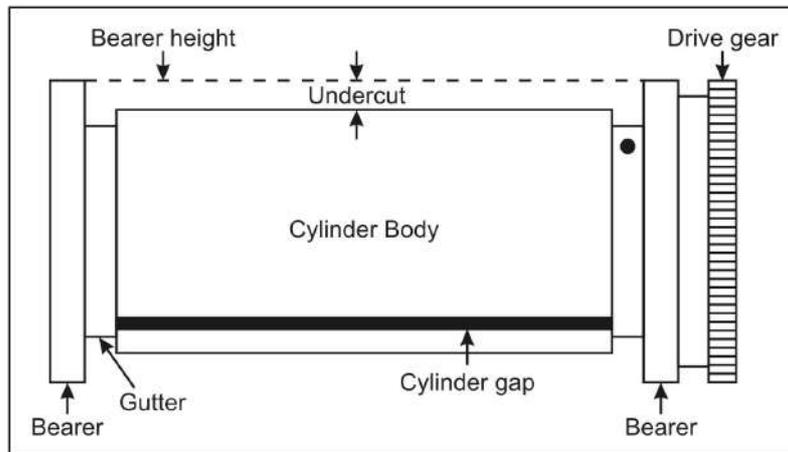
Functions of the Plate Cylinder:

1. To hold the plate tightly for printing.
2. To make the plate in contact with the dampening rollers to wet the non-image area.
3. To make the plate in contact with the inking rollers to ink the image area.
4. To transfer the inked image on to the Blanket.

3.1.2 Blanket Cylinder:

Blanket Cylinder is present between the plate cylinder and the impression cylinder. This is used to hold the resilient rubber material called Blanket for printing. This cylinder consists of the following parts,

- a. Bearers
- b. Cylinder Body
- c. Cylinder gap
- d. Gutter
- e. Undercut
- f. Gear, etc.



i. Bearers:

These are the smooth metal rings present at the two extreme ends of the Blanket cylinder.

ii. Cylinder Body:

Cylinder body is the area which is present between the two bearers. This is used for holding the blanket and the packing sheet.

iii. Cylinder gap:

This is the narrow gap which is present over the cylinder body. In this gap the clamping devices are present to lock the blanket over the cylinder surface.

iv. Gutter:

This is the small groove present between the cylinder body and bearer. This is used to drain the cleaning chemical during wash-up of the blanket.

v. Undercut:

The exact height difference between the cylinder body and bearer is called as Undercut. According to the undercut of the cylinder the thickness of the blanket and backing sheets are calculated. The undercut of the blanket cylinder is more than the undercut of the plate cylinder. Because blankets are thicker than the plates.

vi. Gear:

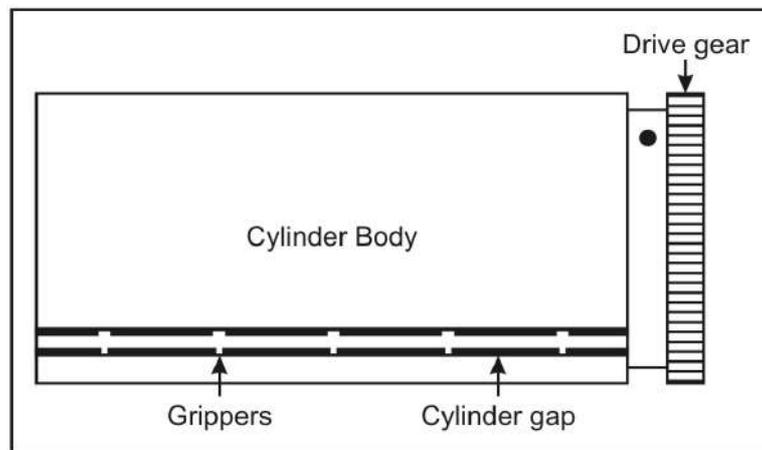
The Gear is present at one end of the blanket cylinder. The gear is used to generate power for driving other cylinders.

Functions of the Blanket Cylinder:

1. To hold the Blanket tightly.
2. To make the offset blanket to contact with the plate for the transfer of inked image.
3. To transfer the inked image on to the paper.

3.1.3 Impression Cylinder:

This is the cylinder present below the blanket cylinder. This cylinder is used to give necessary pressure to the paper with the blanket for the transfer of inked image over the paper surface. The impression cylinder does not have bearers. So no gutter is present in the impression cylinder. The impression cylinder rotates with the help of gear at one end. The cylinder body of the impression cylinder has the cylinder gap. Inside the cylinder gap the grippers are present. The grippers are connected with spring loaded cam mechanism. The spring is used for the opening and closing of the gripper mouth. The cam is used for the “to and fro” movement of the gripper from the cylinder gap.



3.1.4 Transfer Cylinder:

This cylinder is present in the multicolor offset machine. This cylinder is used to transfer the printed sheet from one printing unit to the next printing unit. If the printing machines consists of even number of printing units then odd number of transfer cylinder are present. If the printing machine consists of odd number of printing units then even number of transfer cylinder are present.

During transfer of the printed sheet from one unit to the next unit the marking or smearing problem occur on the printed sheet because of the wet printing ink contact the surface of transfer cylinder. To avoid this problem an ink repellent coating is coated over the thin metal surface and the metal is wrapped around the transfer cylinder to avoid this problem.

Sometimes cloth material may be fitted in loose over the transfer cylinder to avoid the marking problem. Some machines uses air cushion (air-blowing holes) transfer cylinders to blow air to avoid the contact of printed sheet over the transfer cylinder body surface. Like the impression cylinder the transfer cylinder also have cylinder gap in which grippers are present to receive the sheet from first impression cylinder and to transfer the sheet to the next printing unit impression cylinder gripper.

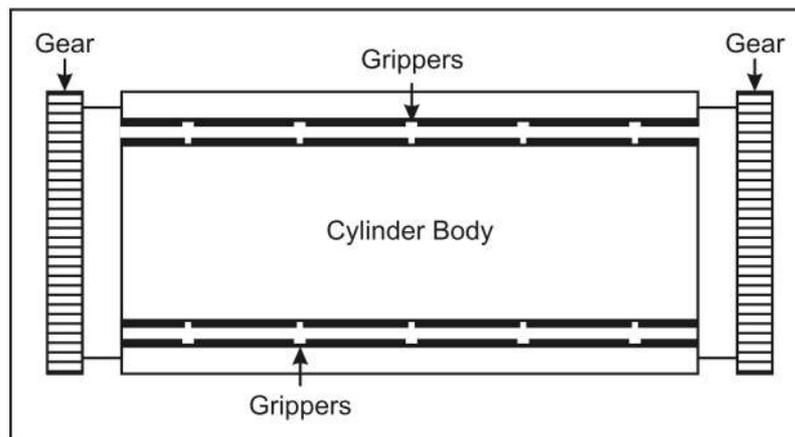
3.1.5 Delivery Cylinder:

The last transfer cylinder present after the printing unit before the delivery unit is called as delivery cylinder. It is constructed in two types.

In one type the cylinder body is fully covered with metal to form a cylinder.

In the second type instead of covering with full metal, steel bars are present in more numbers and are arranged like a drum. Over the steel bars skeleton wheel and star wheel are present for paper transportation.

The delivery cylinder carries an endless chain at two ends, which are also connected with a shaft with gears and the shaft is present at a particular distance from the delivery cylinder. In the endless chain gripper bars are attached carrying grippers to receive the printed paper from the last impression cylinder and to deliver the printed sheet over the delivery pile board. The skeleton wheels or star wheels are movable and can be arranged to contact with the non-image area surface of the printed paper to avoid marking problem.



3.2 Types of Blankets:

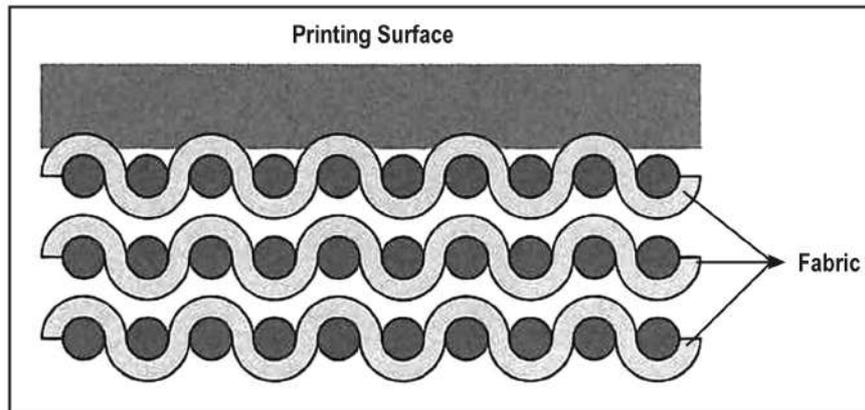
The blankets are classified into two types.

1. Conventional (or) Non-compressible blankets
2. Compressible blankets

These two types are classified according to the behavior during squeezing action of printing nips.

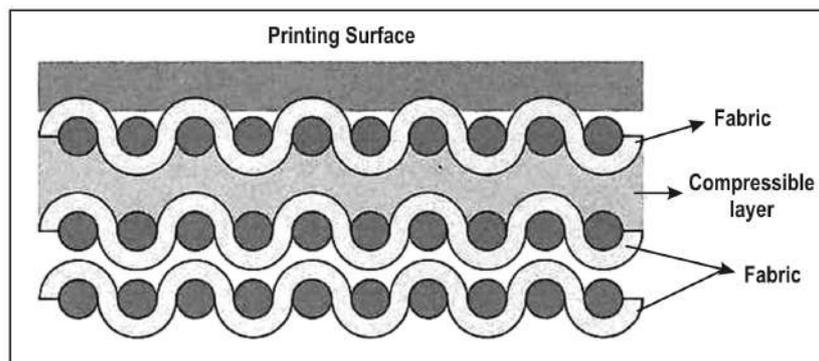
3.2.1 Conventional blanket (or) Non-compressible blankets:

These blankets are used in olden days. These blankets do not have compressible nature because these blankets only have fabrics at its underside. The conventional blanket is squeezed in a nip, it bulges either in one (or) both sides of the nip. Due to this formation of bulge the problem like slurring may be caused. These blankets are used for printing line works, solid tints etc. The disadvantage of these blankets is that these are not use for fine halftone woks.



3.2.2 Compressible blankets:

These blankets are nowadays used in offset printing machines. These blankets consist of compressible layer along with the fabrics layer in its underside. Due to this while printing when the compressible blanket is squeeze in a nip. These blanket bulges very low, which does not, affects the printing quality. These blankets are used for printing any type of solid works, fine halftone works.



Low spots:

Formation of small depression on the blanket surface due to the accumulation of unwanted particles on the paper surface during printing. This leads for the un-printing of images on the paper in that particular formed depressed area. This depression is called as low spot.

Identification of low spots:

The low spots may occur on the blanket surface (or) on the cylinder body. To know where it is formed we have to do the following procedures.

1. Mount the plate with correct packing.
2. Ink up the inking unit.
3. Pass the paper for printing one after one for few papers.
4. Stop the machine and remove the blanket from the cylinder and remount the blanket as trailing edge of the blanket now to act as the leading edge in the cylinder.

5. Now also feed and print some other papers.
6. Now stop the machine and take one already printed sheet and take one printed sheet from the sheets, which are printed after remounting of the blanket.
7. Compare the unprinted spot from the two papers.
8. If the unprinted area is present in the same place of two sheets then the problem is in the cylinder surface. For that the cylinder to be sent to the mechanic for reconditioning.
9. If the unprinted area is present in the different places of the two sheets taken then the problem is in the blanket.

Thus we may identify the low spots.

Rectification:

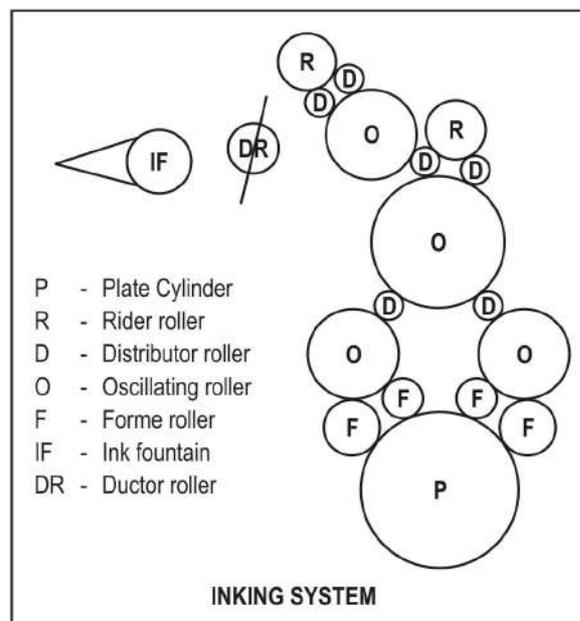
For rectifying the low spots on the blanket the following procedures have to be carried out,

1. Cut a tissue paper as a feathered and paste the tissue paper underside of the blanket low spot found. This will raises the particular spot.
2. The fabric side of the particular spot is swollen by using water turpentine (or) paraffin to raise the depressed area.
3. Injection may be given on the low spot area by using MEK solution.

These steps help for the recovery of original thickness of the blanket at low spot area.

3.3 Construction of Inking System:

The inking system consists of the following parts:



1. Ink duct:

This is the area in which the ink to be printed is stored. The duct of the inking system is formed by a metal roller and a metal blade. Under the metal blade, set and draw screws are present. The set and draw screws are used to make the metal blade contact or out of contact of the metal blade with the metal roller for ink storage.

2. Ink Train:

Ink train means number of rollers present in contact with each other in the inking unit. In the inking unit the metal and rubber rollers are arranged in contact alternatively for the purpose of fine grinding of the ink before it reaches the plate.

The Ink train consists of the following rollers,

- i. Duct roller
- ii. Ductor roller
- iii. Distributor roller
- iv. Oscillator roller
- v. Rider roller
- vi. Forme roller

i. Duct roller:

It forms a part of the ink duct. This is made of steel. This roller is used to supply the ink from the ink duct to the ink train.

ii. Ductor roller:

This roller is made of rubber. This roller is used to receive the ink from the duct roller and supply to the distributor roller. This roller has “**to and fro**” motion.

iii. Oscillator roller:

This roller is made of copper, ebonite or rilson metals. This roller has sideways oscillating movement. The sideways oscillation helps for the fine grinding of ink.

iv. Distributor roller:

This roller is present over the oscillator roller. This roller is made of rubber. This roller receives the ink from the ductor roller and helps the oscillator for fine grinding of ink.

v. Rider roller:

The rider rollers are made of rilson or copper. This roller is present in order to remove the unwanted foreign particles from the ink. The other name of the rider roller is scavenger roller.

vi. Forme roller:

This roller is present two or more in number and are present in the last of the ink train and before the plate. This roller is used to supply the finely grained ink over the

image areas of the plate. This roller is made of rubber. In the inking unit rollers are arranged rubber roller to metal roller contact alternatively to avoid depreciation of rollers and to give finely grained ink for printing.

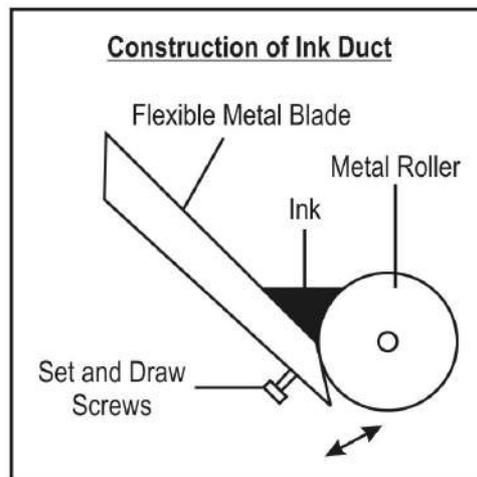
Construction of ink duct:

Ink duct is the part of the inking system, which is used for the storage of ink during printing.

The ink duct consists of the following parts:

1. Metal roller
2. Flexible metal roller
3. Set and draw screws

The contact of the metal roller and metal blade forms a storing duct. This is called as the ink duct. In this ink duct the flexible metal blade is movable. The set and draw screws are present behind the metal blade. According to the adjustment (loosening and tightening) of the set and draw screws in the necessary areas the gap between the blade and roller gets open or closed for the passing of ink to the inking unit rollers in the required level and the ink is applied over the plate for printing.



3.3.1 Roller Setting:

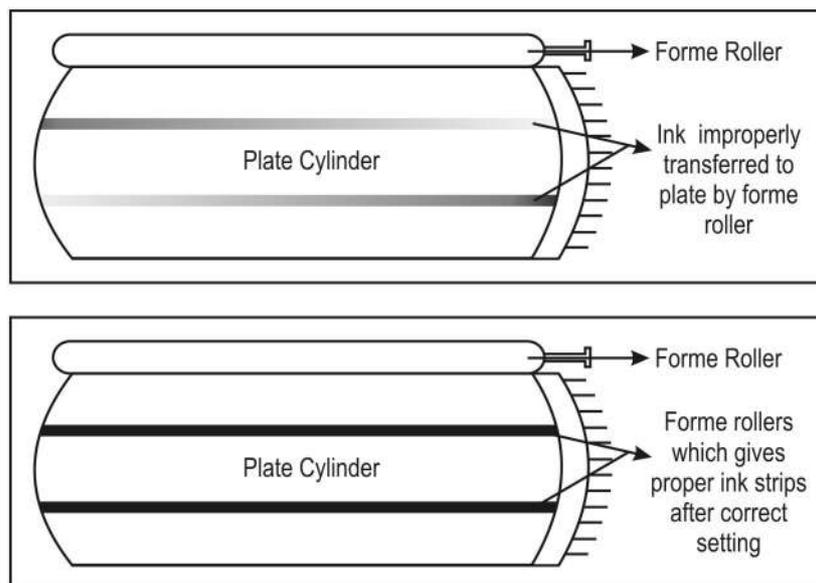
Roller setting is the setting of correct pressure between the inking unit rollers or dampening unit rollers in order to supply the required amount of ink or dampening solution to the plate surface.

Inking Unit Roller Setting:

The inking unit rollers may be set starting from the plate in the plate cylinder and forme roller up to ductor roller to duct roller or starting from duct roller to ductor roller and oscillator up to the plate in the plate cylinder.

3.3.2 Roller Setting between Plate to the forme roller:

1. See the adjustment of forme rollers in the machine.
2. Mount the plate over the plate cylinder with correct packing.
3. Apply the gum over the plate surface and allow it to dry for sometime.
4. Ink up the roller in the inking unit.
5. Make the contact of forme rollers over plate surface.
6. Disengage the contact after sometime.
7. Slowly inch the machine and check whether ink from the forme rollers are formed over the plate in correct length strip with correct width.
8. If all rollers contact points gives correct dense of ink then the pressure set between the plate and forme rollers is correct.
9. If any of the roller does not give proper dense of ink then that roller must be properly adjusted and the adjustment must be checked again by the above procedures up to the correct result have been achieved.



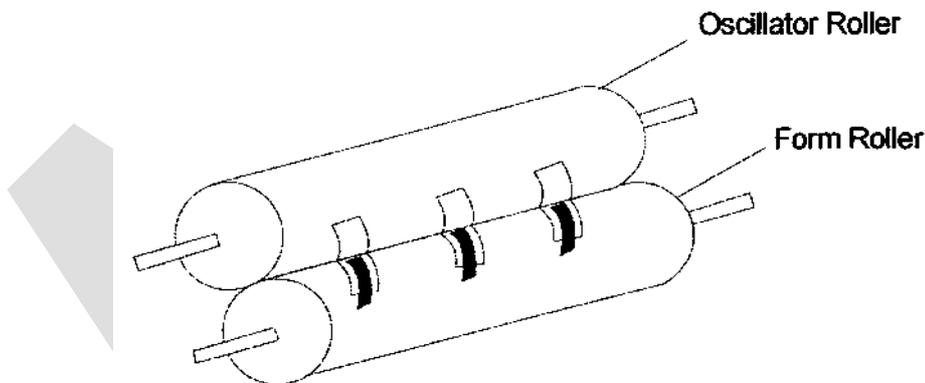
3.3.3 Setting Form roller to Oscillator:

1. See the adjustments of the roller screws which moves the roller while setting pressure.
2. The packing sheet is taken and is cut into 12" x 2" strips in six numbers and 12" x 1" strips in three numbers.
3. The packing sheet which cut should be of 0.05mm thickness.
4. Now the sandwich of film strips is prepared.

5. Sandwiches are prepared in three sets in a way that one 12" x 1" film is inserted between two 12" x 2" film strips.
6. Each sandwich film strips are inserted between the forme roller and oscillator at two ends and also in the centre.
7. Now the machine is slowly inched in order to grip the sandwiches between the rollers.
8. Now the center 12" x 1" film strips are pulled manually for checking the roller pressure.
9. If the pressure pulled is even and in required level in three ends then the roller setting is correct.
10. We can use roller setting gauge in order to measure the pulling pressure correctly.
11. While pulling the strips if any of the strip is absorbed not having proper pressure then pressure setting is adjusted for that strip present in the area and the above procedures are again done for proper setting of rollers.

Thus the forme roller to oscillator pressure is set properly.

Setting Form Roller To Oscillator



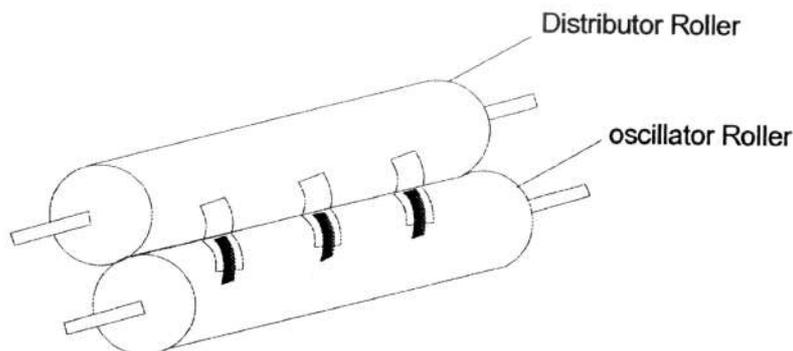
3.3.3.1 Oscillator Roller setting with Distributor Roller :

1. Clean the inking rollers without any ink or washing chemicals.
2. Inch the machine manually till the ductor roller contacts the oscillator.
3. The packing sheet is taken and is cut into 12" x 2" strip in six numbers and 12" x 1" strips in three numbers.
4. The packing sheet which cut should be of 0.05mm thickness.
5. Now the sandwich of film strips is prepared.
6. Sandwiches are prepared in three sets in a way that one 12" x 1" film is inserted between two 12" x 2" film strips.

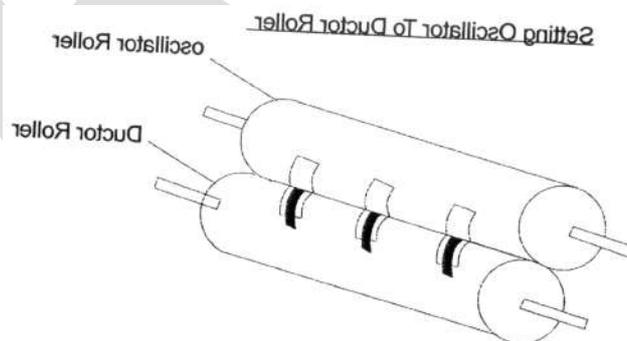
7. Each sandwich film strips are inserted between the Oscillator and Distributor Roller at two ends and also inserted in the centre.
8. Now the machine is slowly inched in order to grip the sandwiches between these two rollers.
9. Now the center 12" x 1" film strips are pulled manually for checking the roller pressure.
10. If the pressure pulled is even and in required level in three ends then the roller setting is correct.
11. We can use roller setting gauge in order to measure the pulling pressure correctly.
12. While pulling the strips if any strip is observed not having proper pressure then pressure setting is adjusted for that strip present in the particular area and the above procedures are again done up to proper setting of rollers.

Thus the pressure between the oscillator roller to distributor is set properly.

Setting Oscillator To Distributor Roller



3.3.3.2 Ductor roller setting with Oscillator roller :



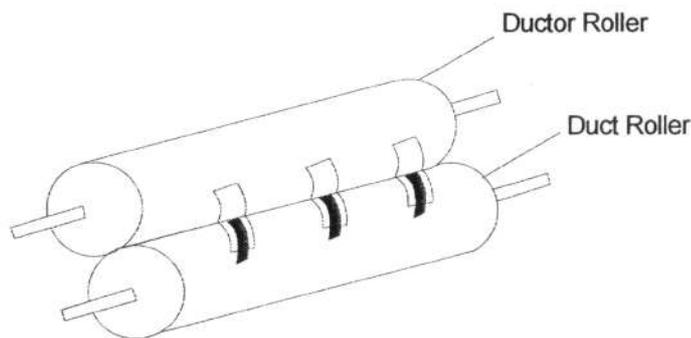
1. Clean the inking rollers without any ink or washing chemicals.
2. Inch the machine manually till the ductor roller contacts the oscillator.

3. The packing sheet is taken and is cut into 12" x 2" strip in six numbers and 12" x 1" strips in three numbers.
4. The packing sheet which cut should be of 0.05mm thickness.
5. Now the sandwich of film strips is prepared.
6. Sandwiches are prepared in three sets in a way that one 12" x 1" film is inserted between two 12" x 2" film strips.
7. Each sandwich film strips are inserted between the ductor roller and oscillator at two ends and also inserted in the centre.
8. Now the machine is slowly inched in order to grip the sandwiches between these two rollers.
9. Now the center 12" x 1" film strips are pulled manually for checking the roller pressure.
10. If the pressure pulled is even and in required level in three ends then the roller setting is correct.
11. We can use roller setting gauge in order to measure the pulling pressure correctly.
12. While pulling the strips if any strip is observed not having proper pressure then pressure setting is adjusted for that strip present in the particular area and the above procedures are again done up to proper setting of rollers.

Thus the pressure between the oscillator to ductor roller is set properly.

3.3.3.3 Ductor roller setting with Duct roller :

Setting Ductor Roller To Duct Roller



1. Clean the inking rollers without any ink or washing chemicals.
2. Inch the machine manually till the ductor roller contacts the oscillator.
3. The packing sheet is taken and is cut into 12" x 2" strip in six numbers and 12" x 1" strips in three numbers.
4. The packing sheet which cut should be of 0.05mm thickness.

5. Now the sandwich of film strips is prepared.
6. Sandwiches are prepared in three sets in a way that one 12" x 1" film is inserted between two 12" x 2" film strips.
7. Each sandwich film strips are inserted between the ductor roller and duct roller at two ends and also inserted in the centre.
8. Now the machine is slowly inched in order to grip the sandwiches between these two rollers.
9. Now the center 12" x 1" film strips are pulled manually for checking the roller pressure.
10. If the pressure pulled is even and in required level in three ends then the roller setting is correct.
11. We can use roller setting gauge in order to measure the pulling pressure correctly.
12. While pulling the strips if any strip is observed not having proper pressure then pressure setting is adjusted for that strip present in the particular area and the above procedures are again done up to proper setting of rollers.

Thus the pressure between the ductor to duct roller is set properly.

3.4 Inking System Problems:

Roller Streaks

Roller streaks are formed due to the heavy pressure setting of roller. The roller streaks are also occurs due to glazed rollers and due to broken roller gear teeths.

Glazed Roller:

Glazed rollers are formed due to the accumulation of gum particles dried over the inking roller surface. Due to this problem of the plate surface the inking rollers does not supplies the uniform and required amount of ink for printing.

Fountain Blade Problems

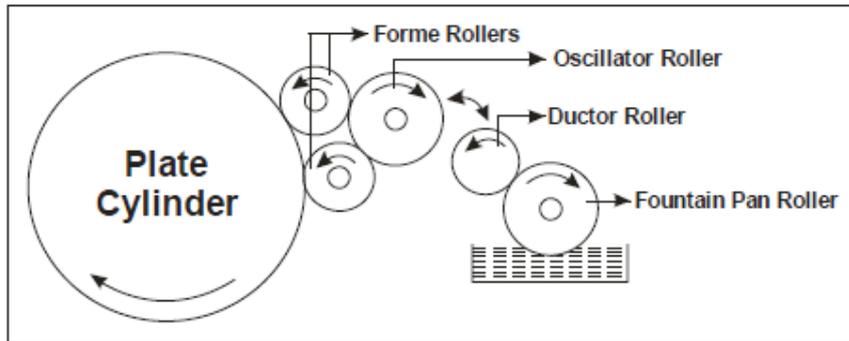
Due to the over tightening of ink keys the fountain blade gets worn-out or wavy. Due to this problem the ink duct cannot able to supply the control amount of ink for printing.

Roller Problems

While inking rollers have any low spots on its surface then the amount of ink supply for printing should not be even. So the roller surface must be even without any low spots. The low spots occur when thick cloth or other unnecessary materials passes between ink rollers.

3.5 Dampening System

3.5.1 Construction of Dampening system



Construction of Dampening system

The conventional dampening system consists of the following parts.

1. Fountain Duct

The fountain duct is used to store the required amount of dampening solution.

2. Fountain Pan Roller

This is the metal roller which is used to supply the dampening solution from the fountain duct to the ductor roller. This fountain pan roller is present and rotates inside the fountain duct.

3. Ductor Roller

This is the intermittent roller present between the fountain pan roller and oscillator. This roller has “to and fro” action. In one action it contacts the fountain duct roller and receives the dampening solution and in the next action it moves and contacts the oscillator and supply the dampening solution to the oscillator.

4. Oscillator Roller

This roller is made of metal. This roller has sideways oscillating movement. This roller is used to even out the received dampening solution over the forme roller.

5. Forme Roller

Forme roller receives the dampening solution from the oscillator roller and applies the dampening solution over the plate surface. The form roller is made of rubber and it is covered by molleton cloth.

3.5.2 Composition of Dampening Solution

The dampening solution is not only water or fountain solution but it is the mixture of particular ratio of water and fountain solution.

1. Water

The dampening solution the water is mixed in maximum ratio. The water mixed should be pure with minimum impurities.

2. Fountain Solution

The Fountain solution used in the dampening solution is in a small ratio. The fountain solution composite of the following particles.

a. Acid or Base

The Acid or Base present in the Fountain solution is used to maintain the pH value while the dampening solution is mixed during printing

b. Gum

The gum Arabic solution is used in the fountain solution to desensitize the non image of the plate.

3. Corrosion inhibitors

These are present in the fountain solution to avoid the reaction of ingredients over the plate to form corrosion.

4. Buffer

Magnesium Nitrate is used as the buffer in the fountain solution which neutralizes the acidity or alkalinity of the solution.

5. Wetting Agent

ISO Propyl alcohol is used as the wetting agent. It reduces the surface tension of water in the dampening solution.

6. Drying Stimulator

During the contact of ink and water over the plate surface the drying capability of the ink becomes low. Hence the drying stimulator helps to speed up the drying of ink.

7. Fungicide

This is used to avoid the formation of fungus while using the dampening solution in the duct.

8. Anti foaming Agent

This is added in the fountain solution to avoid the formation of foams (bubbles) in the dampening solution, when the dampening solution is used in the fountain duct.

9. Alcohol

ISO Propyl Alcohol is used in the fountain solution. This is used to increase the contact angle and reduce the surface tension of water during the use of dampening solution.

3.5.3 Dampening Solution pH

The Hydrogen ion concentration in a solution is called pH. The pH value range from 0 to 14, 0 to 7 is acid and above 7 is base. But 7 is neutral level. In the dampening solution pH value must be 4.5 to 5.5. If in the dampening solution the pH value is more than 5.5,

then it means the base is more than acid, hence to reduce this we have to add fountain solution which reduces the of pH value. If the pH value is less than 4.5, then it means the acid level is more than the base or alkalinity level. So the water is added to increase the pH value to maintain pH between 4.5 to 5.5.

The pH meter or pH paper is used to measure the pH value.

3.5.4 Conductivity of the dampening solution

Conductivity is the term to determine the amount of ion present in the dampening solution. pH is the level of hydrogen ion concentration, hence ion must be present in the dampening solution in a minimum value in order to maintain proper amount of hydrogen ion proportion of dampening solution. If pure water is used for preparing dampening solution water doesn't have free electrons. So ions are not obtained by this water. To prepare the dampening solution the water with minimum impurities is mixed with fountain solution for proper hydrogen ion combination. So the pH of the dampening solution is directly proportional to the conductivity of dampening solution.

3.5.5 Dampening System Roller Setting

Setting of pressure between the dampening rollers is critical. The setting of form roller with oscillator roller and the plate is very important.

1. If the contact pressure is less, the dampening solution will not transfer properly and the form roller will not rotate in full speed with oscillator.
2. If the contact pressure is more the dampening solution will not be transferred, also the more pressure will squeegee dampening solution of the plate and increase the plate wear.

Roller Setting Procedure:

1. The Roller setting is done with plastic strips of thickness 0.05 mm
2. The Nine film strips are cut with three strips of size 1x12" and six strips of Size 2x12"
3. Three sandwiches are made by placing 1x12" plastic strips in between 2x12" plastic strips.
4. Two sandwiches are inserted about 3 inches from each end and the third one at middle.
5. The Middle strip is pulled and checked for pressure
6. For proper pressure, the roller cloth covers should be clean and soft and also the oscillator should be clean.
7. If the pressure pulled is even and in required level in three ends then the roller setting is correct.

8. While pulling the strips if any strip is observed not having proper pressure then the pressure setting is adjusted for that strip present in the particular area and the above procedures are again done up to the proper setting of rollers.

Roller Setting between Plate to the form roller:

1. See the adjustment of forme rollers in the machine.
2. Mount the plate over the plate cylinder with correct packing.
3. The Nine film strips are cut with three strips of size 1x12" and six strips of Size 2x12"
4. Three sandwiches are made by placing 1x12" plastic strips in between 2x12" plastic strips.
5. Two sandwiches are inserted about 3 inches from each end and the third one at middle between plate and forme rollers.
6. Now the machine is inch slowly in order to grip the sandwiches between plate in the plate cylinder and forme rollers.
7. Now the Middle strips in each sandwiches are pulled and checked for pressure.
8. For proper pressure, the roller cloth covers should be clean and soft and also the oscillator should be clean.
9. If the pressure pulled is even and in required level in three ends then the roller setting is correct.
10. We can also use the roller setting gauge for even observation of pressure.
11. While pulling the strips if any strip is observed not having proper pressure then the pressure setting is adjusted for that strip present in the particular area and the above procedures are again done up to the proper setting of rollers.

Dampening system is used in the offset machine which applies required amount of dampening solution over the plate surface. The dampening system is divided into two types.

1. Conventional dampening system
2. Continuous dampening system.

3.5.6 Conventional Dampening System

This system is present in most of the general offset machines. In this type of dampening system the ductor roller does not continuously supplies the dampening solution to the oscillator. The ductor roller present is having to and fro movement. In this movement

the doctor roller goes to get dampening solution from the fountain duct roller and then contacts the oscillator roller to supply the received dampening solution to the oscillator.

3.5.7 Continuous dampening system

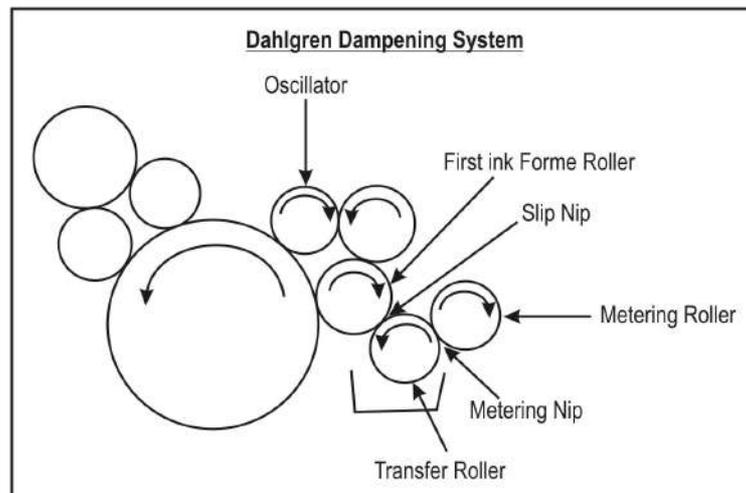
This type of dampening system is present in high speed machines and also in web offset machines. This type of system having doctor roller or other provisions for the continuous supply of the dampening solution.

Dwell period

The time taken by the doctor roller to contact and receive dampening solution from the fountain pan roller and to supply the dampening solution to the oscillator is called dwell period. This term is used in the conventional dampening system.

3.5.8 Dahlgren dampening system:

This dampening system is a continuous and non-conventional dampening system. This system doesn't have any intermittent roller. So it continuously supplies the dampening solution during printing.



This dampening system is an integrated dampening system. In the Dahlgren dampening system the first inking form roller contacts the ink train as well as the dampening roller of the dampening system. So the first form roller of the inking unit supplies both the dampening solution and ink on the plate during printing. Here the metering roller is present in contact with the dampening pan roller to meter the dampening solution supply. The pan roller is connected with an individual motor to increase or decrease its speed inside the duct to supply required amount of dampening solution for printing. The nip of the pan roller and metering roller is also be adjusted for required dampening solution supply.

In this dampening system the alcohol is added in the dampening solution in some more amount to reduce the surface tension. This dampening solution is otherwise called as continuous (or) non-conventional dampening system.

QUESTIONS

UNIT - III

PART – A (2 Marks Question)

1. What are the parts of offset printing unit?

1. Plate Cylinder
2. Blanket Cylinder
3. Impression Cylinder
4. Inking Unit
5. Dampening Unit

2. What are bearers?

These are the smooth metal rings present at the extreme ends of the plate cylinder.

3. What is undercut?

The exact height difference between the cylinder body to the bearer is called as Undercut. According to the undercut the plate thickness and packing thickness are calculated.

4. What is gutter?

This is the small groove present between the cylinder body and bearer. This groove is used to drain the washing chemicals from the plate surface.

5. What is gear?

The Gear is present at one side of the cylinder which is used to generate power for driving other cylinders.

6. What are the plate metals?

Zinc and Aluminum.

7. What is blanket?

Blanket is a resilient rubber material used to receive the ink from the plate image and the same to transfer on paper.

8. What is conventional blanket?

Conventional blanket is the blanket used in the offset machines which does not compress. It is used for solid ink works.

9. What is compressible blanket?

Conventional blanket is used in offset machines which is having compressible nature because of air cushion arrangement which is used to fine halftone works.

10. Why the undercut of blanket cylinder is more than the undercut of plate cylinder?

Because the blanket thickness more than the plate cylinder.

11. What is transfer cylinder?

Transfer cylinder is present in the multicolor offset machine. This cylinder is used to transfer the printed sheet from one printing unit to the next printing unit.

12. What is delivery cylinder?

Delivery cylinder is used to receive the printed paper from the last impression cylinder.

13. What is gripper?

Gripper is used to hold and carry the lead edge of the paper from printing unit to delivery unit.

14. What is gripper bar?

Gripper bars are used to hold the grippers to carry the paper for printing and deliver the printed sheets.

15. What are the types of dampening system?

1. Conventional dampening system
2. Continuous dampening system

16. What is the pH value of the dampening solution maintained in offset printing?

4.5 to 5.5 pH value of the dampening solution is maintained.

17. What are the two methods of roller settings?

1. Ink strip Method
2. Sandwich Method

18. What are roller streaks?

Roller streaks are formed due to the heavy pressure setting of roller. The roller streaks are also occurs due to glazed rollers and due to broken roller gear teeth.

19. How glazed roller are formed?

Glazed rollers are formed due to the accumulation of gum particles dried over the inking roller surface.

20. What is the other name of rider roller?

Scavenger Roller

21. What is the problem caused due to low spot in doctor roller?

While inking rollers have any low spots on its surface then the amount of ink supply for printing should not be even.

22. What is intermittent roller?

The roller which is present between dampening pan roller and vibrator (oscillator) roller is called intermittent roller.

23. What is dwell period?

The time taken by the ductor roller to contact and receive dampening solution from the fountain pan roller is called dwell period.

24. What is dampening solution?

It is the mixture of water and fountain solution in a particular ratio.

25. What is the purpose of gum used in dampening(fountain) solution?

Gum is to desensitize the non-image areas of the plate.

26. What is corrosion inhibitors? Give example

Corrosion inhibitors are present in the fountain solution to avoid the reaction of ingredients over the plate to corrosion.

27. What is buffer?

Magnesium Nitrate is used as the buffer in the fountain solution which neutralizes the acidity or alkalinity of the solution.

28. What is a wetting agent? Give example.

Isopropyl alcohol is used as the wetting agent. It reduces the surface tension of water in the dampening solution.

29. What is fungicide?

Fungicide is used to avoid the formation of fungus while using the dampening solution in the duct.

30. What is the use of anti foaming agent?

Anti foaming agent is added in the fountain solution to avoid the formation of foams (bubbles) in the dampening solution, when the dampening solution is used in the fountain duct.

31. Why alcohol is used in dampening solution?

Alcohol is used to increase the contact angle and reduce the surface tension of water during the use of dampening solution.

32. Which alcohol is used in the dampening solution?

Isopropyl Alcohol is used in dampening solution.

33. What is emulsification?

Improper balance of ink and water is called emulsification.

34. What are emulsification problems?

- If ink level is higher than water level the emulsification problem occurred.
- If water level is higher than ink level the emulsification problem occurred.

35. What is scumming?

Printing on non image area is called scumming.

PART – B (Three Marks Questions)

1. What is a cylinder body?

Cylinder body is the area in which the plate has to be mounted. In this cylinder body a narrow gap is present. In this gap the plate locking devices are present. This gap is called as cylinder gap.

2. What is skeleton wheel and star wheel?

The skeleton wheels or star wheels are movable and can be arranged to contact with the non-image area surface of the printed paper to avoid marking problem. Instead of skeleton wheel on the shaft of the delivery drum for transportation of the printed papers.

3. What will do when the pH value is more than 5.5?

If the pH value is more than 5.5, then it means the base is more than acid, hence to reduce this we have to add fountain solution which reduces the of pH value

4. What will do when the pH value is less than 4.5?

If the pH value is less than 4.5, then it means the acid level is more than the base or alkalinity level. So the water is added to increase the pH value to maintain pH between 4.5 to 5.5.

5. What is a glazed roller?

Glazed rollers are formed due to the accumulation of gum particles dried over the inking roller surface. Due to this problem of the plate surface the inking rollers does not supply uniform and required amount of ink for printing.

6. What is skeleton wheel and star wheel?

The skeleton wheels or star wheels are movable and can be arranged to contact with the non-image area surface of the printed paper to avoid marking problem. Instead of skeleton wheel on the shaft of the delivery drum for transportation of the printed papers.

7. What are the fountain blade problem

Due to the over tightening of ink keys the fountain blade gets worn-out or wavy. Due to this problem the ink duct cannot able to supply the control amount of ink for printing.

8. What is drying stimulator? Give example.

During the contact of ink and water over the plate surface the drying capability of the ink becomes low. Hence the drying stimulator helps to speed up the drying of ink.

PART – C (Ten Marks Questions)

1. Explain the construction of a typical inking system with sketch?
2. Explain the inking system roller setting?
3. What are the composition of dampening solution?

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UNIT – IV : WEB FED OFFSET PRESS – INFEED AND WEB GUIDING DEVICES

4.1 Historical Development of Web Fed Offset Presses:

In mid-1930s webfed offset presses saw an increasing demand for heavily illustrated mass-market magazines, which inspired the development of a headset ink drying system for high-speed rotary letter press printing. At this time web offset lithography was beset by technical problems and was not yet ready for high-speed, large-volume production. But by the late 1940s, lithographic platemaking had been perfected and web offset manufacture's adapted the inks and drying systems developed for high-speed magazine letterpress printing - this about thirty-five years after the first web offset press had built.

By 1950s, web offset was ready for serious competition with letterpress, as well as with sheetfed lithography. The ability of the web offset method to perfect (print on two side of the sheet simultaneously) was unique, and high productivity was the reward for any printer who made the switch to web offset. In the 1950s, and early 60s, printing companies buying their very first web offset presses accounted for most of the growth continued and web offset began to cut heavily into letter press sales.

Newspapers began converting to web offset during the 1960s, when over half the weeklies and 20% of the dailies switched from the letterpress to web offset was influenced mainly by the growth of each plant's operations. As demand grew, most large daily newspaper operations are quickly replaced slower letterpress equipment with high-speed web offset lithographic presses. National and international newspaper production and distribution have been made possible by the use of satellite transmission and digital telephony to connect publishers to printing plants in varied geographic locations around the world. Prepress production for lithography has been well suited to the application of digital data transmission required in such an arrangement.

Currently, about 70-80% of all books are printed on web offset presses. It was during the 1960s that periodical publishers turned more and more to web offset, increasing the value of web-offset produced periodical shipments from \$50 million to \$210 million. Today many large-edition weekly magazines are printed in regional editions similar to newspapers produced with digital content moving by way of satellite transmission and telecommunications. The bulk of web offset printing markets today include direct mail, magazines and inserts, newspapers, catalogs, books and other forms of general commercial printing. With all of these markets turning to web offset during the 60's, this printing method experienced a dramatic increase in the value of printed products, starting out the decade at \$60 million in shipments and ending it at \$830 million.

The continued growth of web offset has depended upon improvements in equipment and supplies. The quality of the papers, inks, plates, blankets, and other press supplies has constantly improved to meet the ever-increasing requirements of great speed and quality

demand by the web offset printing market. Along with this, improvements in press and related equipment including infeed, dryers, and folders have kept pace with the growing demand for increased speed and quality.

In the past, much of the growth of web offset printing due to the economic involved. Savings due to fast makereadies and high production speeds alone motivated many printers to switch to web offset, regardless of other factors. Today, there are many buyers of printed products who depend upon print quality as a foremost consideration, seeking the ability of heatset web offset to produce printing that is exceeding sharp, with high gloss and heavy ink coverage.

These are the presses which prints the reel of paper.

4.2 Types of Reel Stands:

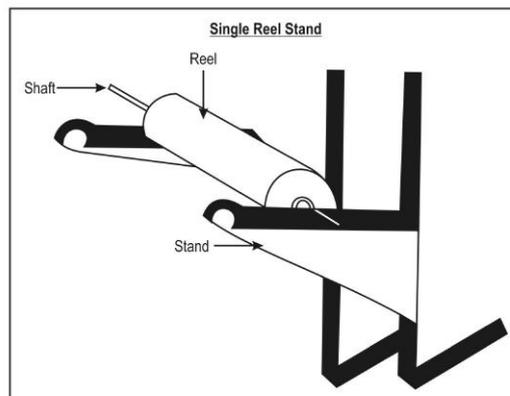
There are four types of reel stands are present, they are

1. Single roll stand
2. Double roll stand
3. Three roll stand and
4. Two roll pastor

Types of Reel Stands:

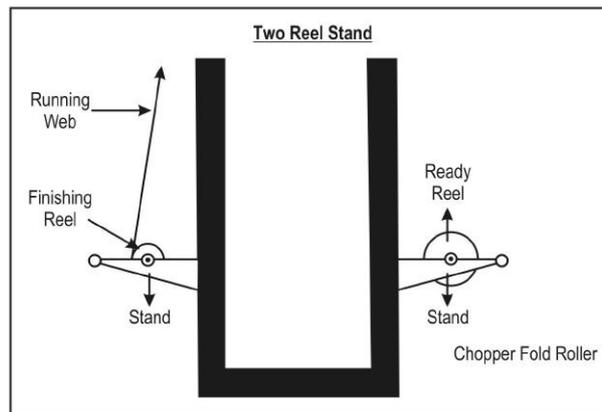
There are three types of reel stands are used in the web offset machine. They are,

4.2.1 Single reel stand:



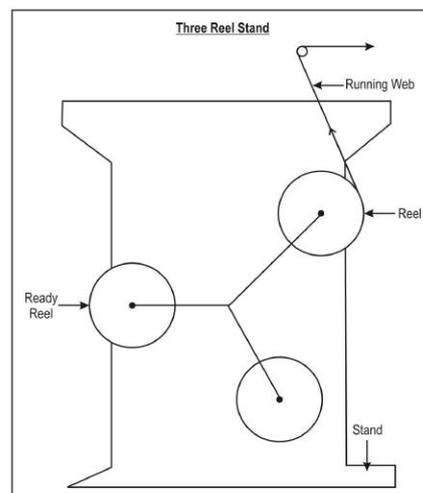
These are used in the web offset machines which holds single reel for printing. These reel stands are used beginning stage web offset machines. These machines need manual mounting and webbing up operations of the web roll on the machine. These machines consume more time for mounting and readying the machine for each changeover of new web.

4.2.2 Two reel stand:



These reel stands are used in the web offset machines which splice the new web roll automatically. As machines automatically splice the new web, there is no need to stop the machine for splicing. So, high production to be obtained in the machines which uses these types of reel stands.

4.2.3 Three reel stand:



These reel stands are used in the high speed web offset machines. Here while a web is running two rolls are present in reserve for next splicing cycle. Here in these web offset machines no need for stopping because the splicing is being performed automatically during the machines is running at the operating speed. The first two roll stands are used for manual pasting. Three roll stand and Two roll pastors are used for automatic pasting of new web.

4.2 Automatic Splicers:

These are the splicer which automatically splices the new web for printing without stopping the machine. Automatic splicer is classified into two types,

- i. Zero speed splicer and

- ii. Flying speed splicer

4.2.1 Flying speed splicer

Splicing Sequence of Zero Speed Splicer or Paster:

Zero speed splicers:

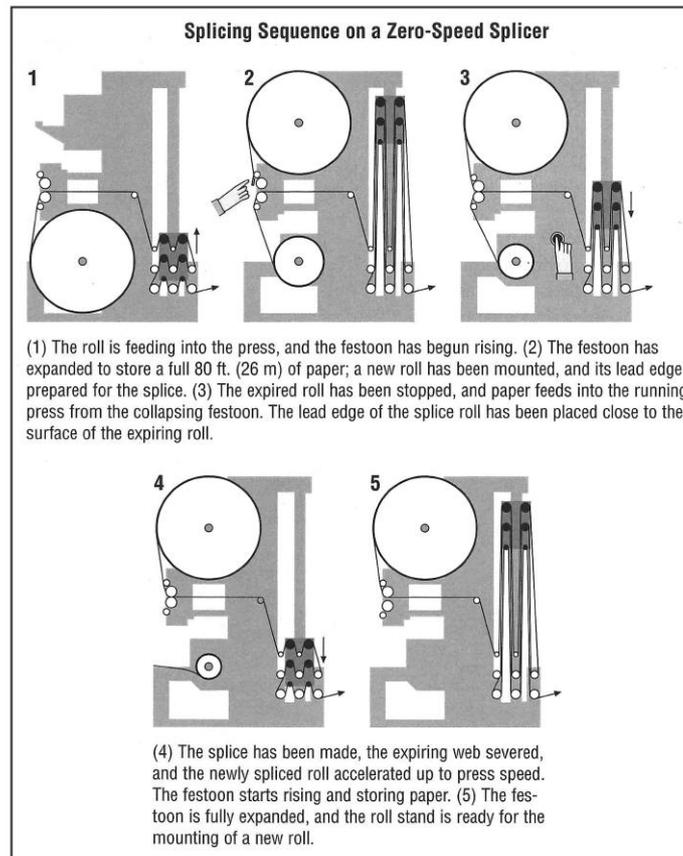
The zero speed pastors splice the new web when the new web is stationary but the machine is running at the operating speed.

Festoon:

It is a set of collapsible rollers which have up and down movement. These rollers collect approximately 80 fetes of web from the running roll. It gives that collected web for printing when the when the old expired web is stopped and pasted with the new web.

Steps for Splicing:

- When the web is fed into the press and the machine is running the Festoon rises up and stores about 80 feet or 24 meters of paper from the running web.
- The new web roll is mounted in the in feed area and its leading edge is prepared for splicing.
- When the old web expires that roll is stopped and it is attached with new roll.
- The machine is not stopped during this time, but the paper is feed for printing from the festoon.
- The festoon comes down slowly and continuously supplies the stored paper for printing.
- In this time the old web is attached with the new roll and the old web is cut away.
- The festoon collects the required amount of paper from the web for 80 meters and rises up.



4.2.2 Splicing Sequence of Flying Speed Splicer:

Flying speed splicer:

The flying speed splicer pastes the new web roll with the running web when the machine is running at the operating speed.

Sensors:

The sensors present are used to monitor the status of the diameter of the expiring web. Some presses use two butt switches to monitor the diameter of the expiring web roll.

Butt switch:

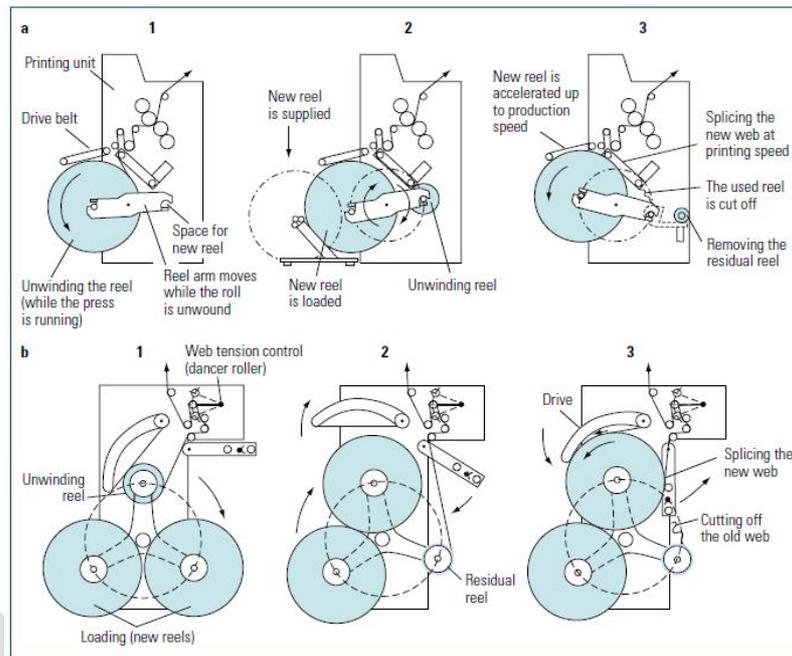
A butt switch is a spring loaded metal finger riding at the side of the running web.

Splicing sequence:

- In the three arms flying speed splicer the first butt switch gives signal when the diameter of the running web reaches 8 inch in diameter.
- This causes the accelerating belt and splicing arm from running position to pasting position.
- A reflector tab is pasted at the side of the new roll.
- The accelerating belt rotates the new web to the machine.

Offset Printing Technology

- The second butt switch activates a photo cell when the expiring web diameter reaches 4 inch.
- When the signal from the photocell reaches the reflector tab and while the new roll running, the pressure roller give pressure to the new roll with expiring roll for pasting and the knife cut the expiring roll and the splicing is made.
- After splicing, the accelerating belt and the splicing arm go to the original position.

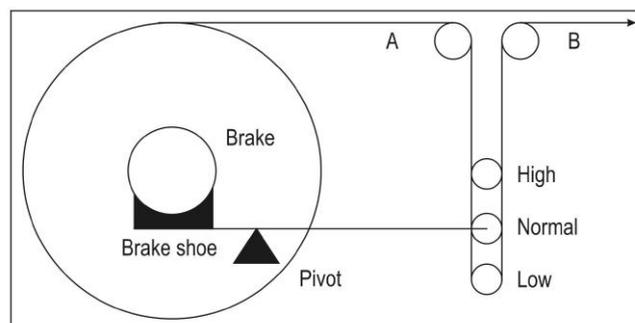


Automated reel change - a Reel splicer, two-arm version (simple version, integrated in a printing unit); b Reel splicer, three-arm version (IFRA)

4.3 Web Control

4.3.1 DANCER ROLLER:

This is the roller which is present before the printing unit and after the unwind area. The purpose of the dancer roller is to maintain the flow rate and to control the web tension.



- From the diagram part A is the paper coming from the web roll and part B is the paper going to the printing unit. The dancer roller is present between roller A and B.
- The dancer roller is connected with a braking mechanism connected with a pivot present in the running web roll side.
- If the paper feeding from the point A is lesser than point B, then the dancer roller carrying paper rises up and this movement looses the brake connected with the web.
- If the paper feeding from the point B is faster than the point B then the dancer roller moves to the bottom level from its original position and it activates the braking mechanism to slow down the web feeding.
- If the paper feeding from the point A is equal to the paper feeding from the point B then the dancer roller rotates in its normal position.

4.3.2 Metering Roller:

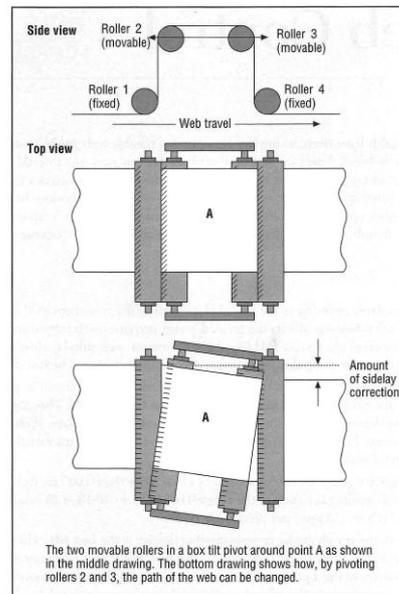
For quality web printing, the infeed has two or three metering rollers located between the dancer and the first unit of the press. The metering rollers help to keep the web tension and flat when entering the first printing unit. Two of the infeed metering rollers are driven steel rollers and the third is non-driven rubber roller. All three are set with a squeeze between them to grip the web.

The infeed metering rollers establish tension in the web, however, they do not always adequately control it. The tension of a given paper under a consistent drawing rate can still change with the unwinding of the roll (this is due to variations in the structure of the paper from one point in the roll to another).

4.3.3 Box Tilt or Sidelay:

Side lay is the device which is used for the lateral adjustment of the web for correct registration. This device is called as web steering device. These are present before the printing unit and folding unit for correct image registration and correct folding. In the web offset press the common steering device used is box tilt.

From this diagram the steering device consists of four rollers. The rollers one and four are fixed. The roller second and third is adjusted forward and cockling. When the web has to be adjusted for rectifying cross, by the adjustment of second and third rollers the position of the web is also gets adjusted and the web is perfectly for correct register printing.



4.3.4 Web Break Detectors:

These are the devices used to identify the web breaks and the cut edge of the web, when the web is folding. It is operated mechanically, electronically and pneumatically.

Mechanical web break detectors:

These detectors are either rollers or metal fingers present by contacting the web surface during the web pass. When the teared edge in the web reaches this device, then the detector moves down and activates a trip switch. When the trip switch gets activated the machine will suddenly stop.

Electronic web break detectors:

In this type a photocell is present at the top of the web path and a receiver is present at the bottom area of the path. These devices are present in pairs at opposite edges. When the teared edge crosses the photocell or the web gets break, the signal from the photocell reaches the receiver which leads the machine to stop.

In the another type of this detectors, the photocell and the receiver are provided at the top area of the web path at an angle by which the gets reflected signal from the web reaches the receiver. These detectors are also present in pair at opposite edges of the web path. During the web passes and due to this device the signal from the photocell reaches the web surface and gets reflected and the signal is collected by the receiver. If any teared web or any web break occurs, the signal does not received by the receiver which leads the machine to stop.

Pneumatic web break detectors:

In this type of detectors air blowing nozzles are present at the opposite edges of the web path. The receivers are present at the bottom of the air blowing nozzles and the web

path. During the running of the web the air from the blower nozzles gets blocked by the web surface. If any teared web passes the blower or any web break happens, then the air from the nozzle reaches the receiver which leads the machine to stop.

4.3.5 Bustle Wheels:

These are the wheels, which are used to control the printing problems due to the fanout of web running related to width direction (RRW). This fanout occurs due to the fibers expansion when the web gets printed from the printing unit.

These wheels are provided nearer to the printing nip. This wheels are present at the second, third, fourth unit etc., The main purpose of the bustle wheel is to shorten the image size when the fibers gets expanded and to make the image in correct register in all the units. These wheels are provided in the underside of the web path.

These wheels are moved up to contact the web according to the amount of fanout of web along the width. Sometimes marking problems may happen due to the contact of bustle wheels, so nowadays air bustles are used instead of bustle wheels.

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QUESTIONS

UNIT - IV

PART – A (Two Marks Questions)

1. What are types of reel stand?

Single reel stand, Double reel stand and Three reel stand and two roll poster.

2. What is manual splicing?

Manual **means** splicing of the new web roll with expired roll manually by stopping the machine.

3. What is the purpose of dancer roller?

Dancer roller control the web tension and flow rate of the web.

4. What are the two types of automatic splicer?

Flying speed splicer and zero speed splicer.

5. What are the different types of splicer?

Different types of splices are manual splicing and automatic splicing.

6. What is a butt switch?

Butt switch is a spring loaded metal finger riding at the side of the running web. It is used to monitor the diameter of the expiring web roll.

7. What will happen in an automatic splicer when the roll reached 8” inch diameter?

The accelerating belt and splicing arm move from running position to pasting position.

8. What will be happen in an automatic splicer when the roll reached 4” inch diameter?

At 4 inch diameter the pressure roller gives pressure to the new web to the machine speed.

9. What is accelerative belt?

Accelerative belt rotates the mounted web roll to the machine speed.

10. What is template?

Template is a metal board. This is used to tear the web leading edge in a particular pattern during the web roll for splicing operation.

11. What is zero speed paster?

Zero speed splicers which pastes the new web roll with the old web roll when the machine web is stationery and the machine running at the operating speed.

12. What is flying speed paster?

Flying speed splicers which paste the new web roll with the running web roll when the machine is running at the operating speed.

13. What is the purpose of metering roller?

Metering roller is used to control the web tension of the machine.

14. What is the use of box tilt or side lay?

It is used to adjust the running web laterally for correct registration of image.

15. What are the types of web break detectors?

Mechanical, Electronics and pneumatic web break detectors.

PART – B (Three Marks Questions)

1. Briefly explain the development of web offset.

In mid-1930s webfed offset presses saw an increasing demand for heavily illustrated mass-market magazines, which inspired the development of a headset ink drying system for high-speed rotary letter press printing. The ability of the web offset method to perfect (print on two side of the sheet simultaneously) was unique, and high productivity was the reward for any printer who made the switch to web offset. In the 1950s, and early 60s, printing companies buying their very first web offset presses accounted for most of the growth continued and web offset began to cut heavily into letter press sales.

2. Draw and explain two roll stands.

These reel stands are used in the web offset machines which splices the new web roll automatically. As machines automatically splice the new web, there is no need to stop the machine for splicing. So, high production to be obtained in the machines which uses these types of reel stands

3. Draw and explain three roll stands.

These reel stands are used in the high speed web offset machines. Here while a web is running two rolls are present in reserve for next splicing cycle. Here in these web offset machines no need for stopping because the splicing is being performed automatically during the machines is running at the operating speed. The first two roll stands are used for manual pasting. Three roll stand and Two roll pastors are used for automatic pasting of new web.

4. What is a festoon?

Festoon is a set of collapsible rollers which have up and down movement. It stores about 24 meters of web from the running web. It gives the stored web during splicing of new roll with old roll.

5. What is the use of bustle wheel?

Bustle wheel is used to control the printing problems due to the fanout of the web running related to width direction.

PART – C (Ten Marks Questions)

1. What are the reel stands? And explain them with neat sketch.
2. Explain the sequence of operation of flying speed splicer with diagram.
3. What are the automatic splicers? Explain the zero speed splicers with neat sketch?
4. What is web control? Explain the web control devices?
5. Explain about the web break detectors used in web offset machines?
6. Explain about dancer roller and metering roller with neat sketch.
7. Explain about box tilt and bustle wheel with neat sketch.

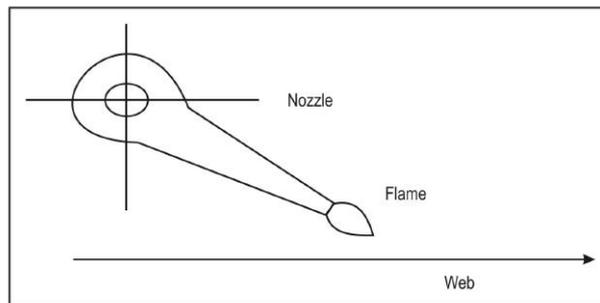
UNIT – V : WEBFED OFFSET PRESS – DELIVERY UNIT

5.1 Types of Dryers:

The web offset press mostly uses blanket to blanket type for prints for drying the both sides of the web floating dryers are used. There are classified into three types

1. Open flame
2. High velocity hot air dryer
3. Combination dryer

5.1.1 Open flame dryer:



This is the oldest type of dryer. In this type the flame is directly fall over the web from nozzles attached in particular angle. These nozzles are attached from a particular distance from the web to avoid fire creating on web.

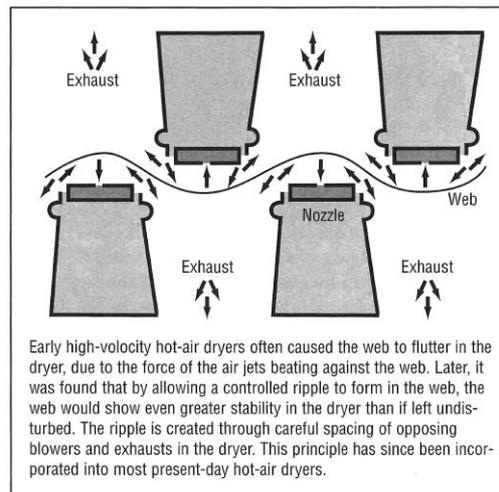
The disadvantage of these dryer is that it completely absorbs the moisture present in the web of paper.

5.1.2 High velocity hot air dryer:

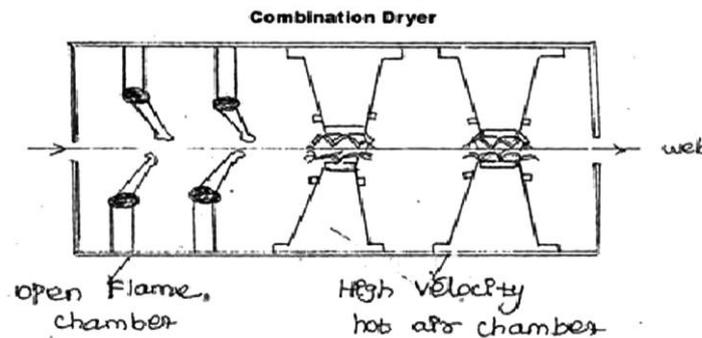
This dryers blows hot air over the web for drying the ink. The nozzles are present for blowing hot air. Between the nozzles exhaust ducts are present to vent the blowed hot air to maintain uniform hot air formation.

In the initial stages of series nozzles are present in the web offset in a manner that two nozzles are facing each other below and over the web path. This causes the web to become wrinkles. These wrinkles are called corrugations.

In later stage to avoid corrugations reach and every nozzles are arranged alternatively in a particular distance.



5.1.3 Combination dryer:



The combination dryers use the combination of open flame as well as the hot air dryers.

In this type the web first passes through open flame type and next through the hot air blower nozzles. Due to these types the ink on the web goes to quickly dried.

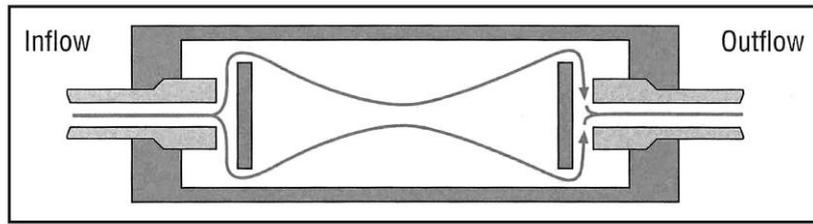
5.1.4 Chill rollers:

These are polished surface rollers with large diameter. These rollers have water circulation inside its body. This rollers are present two or three in each machines and are used for the retains at moisture over the paper surface after the paper come from the dryer.

The chill rollers are configured by three designs.

First design:

In the first design the water is pumped into the chill roll by using an inflow nozzle from one end from the next end out flow nozzle carry out the water from the roll body.

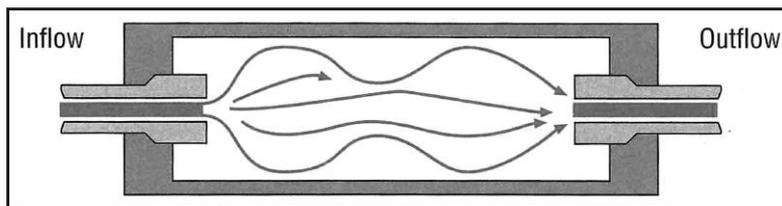


In this design the centre of the chill roll have enough. Chilling temperature and the ends of the rolls doesn't have proper cool temperature. This is because of uniform presence of water in the ends. So the edges of the web also don't set uniform chillness.

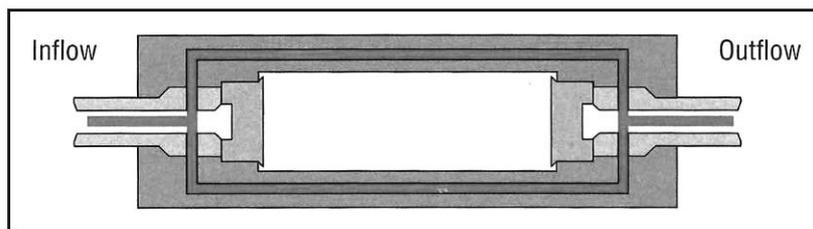
5.1.5 Baffle Plate Chill Roller

In the second design baffle plates are provided inside the chill roll body. The water is supplied from the inflow and gathered at the outflow.

In this type the edge are alone gets necessary chillness and the centre area does not get as much chillness. So the centre part of the web also does not get necessary moisture.



5.1.6 Jacketed Chill Rollers:



Jacketed Chill Rollers was constructed as a jacketed chill roll. Inside the chill roll box a void is provided the water is supplied between the thin sheets of void end chill roll inner surface.

By this type a small amount of water gets passed throughout the roller. This type also maintains uniform chillness in all the surface of the chill roll. Hence the web also receives uniform moisture in all its surface after drying.

5.2 Types of Web Folding

Folding:

Creasing or softening the fibers to form signatures is called folding.

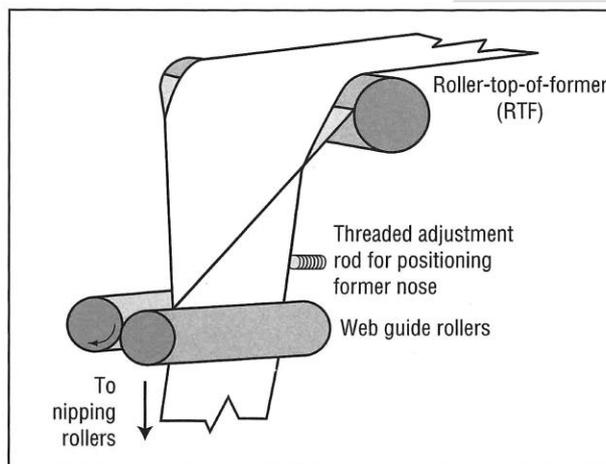
Web folding:

Folding the reel of printed sheets and slitting to form signatures is called web folding.

Mechanics of Folding:

In the web offset printing machines the paper web is folded by three principles.

5.2.1 Former folder:



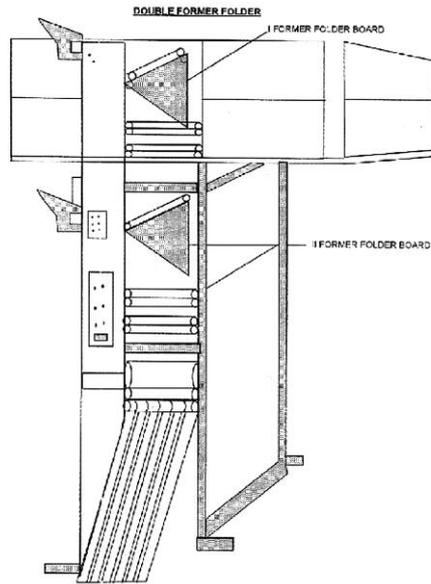
This fold is done on the paper in its grain direction in this folder a large triangular polished metal board consist of a sharp nose guide and nipping rollers. The folding is made when the web passes over this former board and between guide and nipping rollers.

This folder is used to fold the paper in its grain direction. This folder consists of a sharp nose, guide and nipping rollers. The former fold is done on the paper when the web passes the board, wiping rollers and guide rollers.

5.2.2 Double former folder:

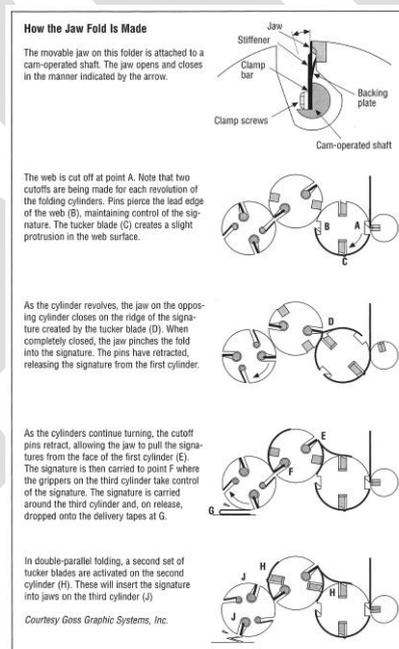
This type of folder is used in the high speed machines. This folder is called as former and cut off folder. In this folder one folder is present at the top and another folder is present at the bottom of the first folder.

This folder only folds single fold in the back bone side. Each folder can deliver up to 2 streams of signatures will be obtains. In each folder two paths for delivery of signature is present as these folders are used in very high speed machines this makes the gathering of folded signatures easy.



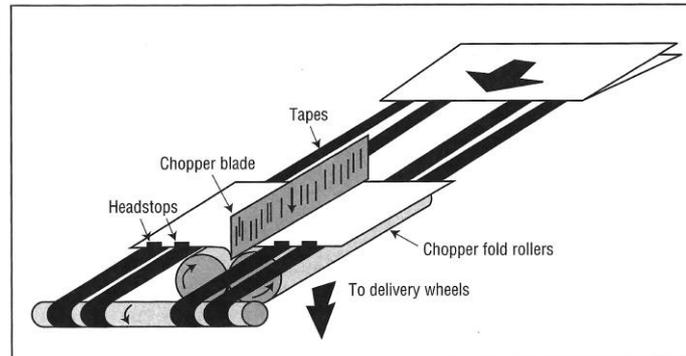
5.2.3 Jaw folder:

This fold is done across the grain direction of paper. In this type after the web gets folded in the former folder. The web passes between the cutting blade shaft and a folding cylinder. In this place the web gets cut in the required place. Then it is carried around the folding cylinder by a series of pin mechanism. After this when the tucker blade area in the folding cylinder and jaw of the jaw cylinder contacts the tucker blade pushes the centre of the paper into the jaw of jaw cylinder for second folding.



5.2.4 Chopper folder:

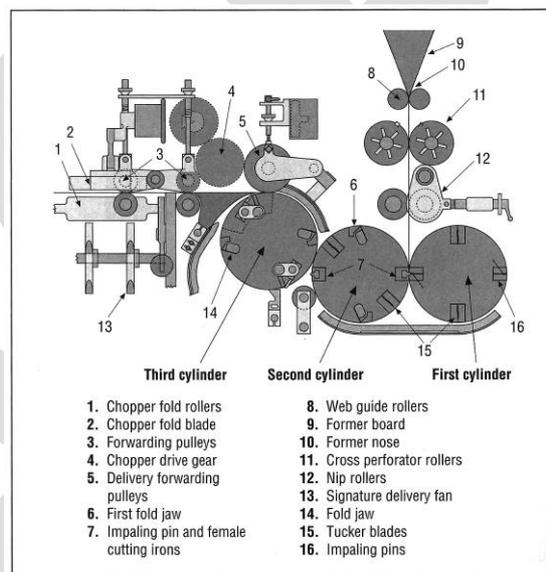
This is the quarter or final folder at the machine. After the second folding the paper sees to the paper area with its folded edge. Moving forwards in the chopper Folding area the folded paper gets blocked in a mechanism and its centre area is pushed between uniform two rollers by using a knife mechanism. Thus the final folding is done.



Types of folder

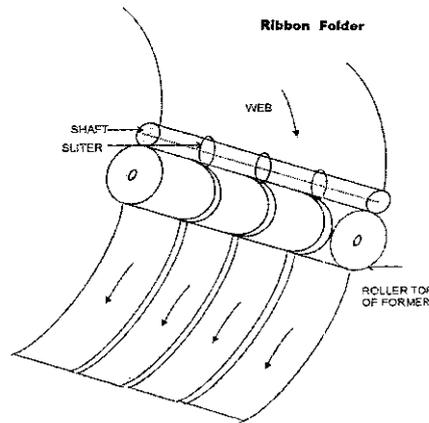
There are three types of folding. They are as follows:

5.2.5 Combination folder:



This folder is used to fold the large web of paper with widths ranging from 34" to 40". As this folder uses former folder jaw folder and chopper folder. These folders are called combination folder. This type of folders are used in news paper and magazine production machines this folder can fold the signatures with 8 pages, 16, 32 pages etc.

5.2.6 Ribbon folder:



In this folder former fold is not present the paper web is slitted into several ribbons by using slitting wheels over the top of the metal roller. Then the slitted web of ribbons is turned in different angles by using turner bar mechanism. These ribbons are then combined with one another and cut by using cutting mechanism and the finally combined signatures are folded by using jaw folding mechanism to obtain finished signature. In this folder turner bars are provided with holes to blow low pressure air to form an air cushion between turners bar and paper web to form a gap to avoid smearing problem.

5.3 Auxiliary Devices (Auxiliary Equipments):

These are the devices or equipments which are present in the web offset machine, which perform the extra operations on the paper after it gets printed.

The main auxiliary devices used in the web offset machines are,

- Stackers
- Bundlers
- Sheeters
- Perforators
- Imprinters

5.3.1 Stackers:

These are the devices which count the group of folders signatures and they are having rotating table which rotates for about 180 degree in order to position alternative placement of folded signatures. This rotation helps to correct placing of folded edges without bulge at any onside.

5.3.2 Bundlers:

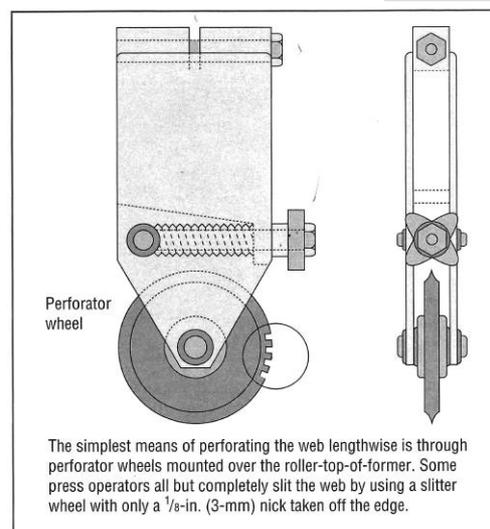
After the stackers the folded signatures reaches a sealing mechanism. The sealing device seals the stacked signatures by a plastic transparent paper and transparent the sealed counted products to bundling device. The bundling device ties the sealed products with straps tightly and delivers the bundler products for dispatching.

5.3.3 Sheeters:

These are the devices which convert the web of printed reel into sheets. Sometimes posters, plates, or inserts have to be printed in the web offset machine. They need not to be folded. So these sheets are used to cut these products sheet by sheet after printing.

In some machines the sheeters are not present as auxiliary equipment. So the web roll after printing is taken to a sheeter and one converted into sheets.

5.3.4 Perforators:



These are the devices which are provided in the R.T.F. roller. The perforators are used in the web offset machines in order to produce series of holes on the printed web for easy tearing in the necessary areas. Sometimes the perforators may also be arranged in the nipping wheel for producing holes in the folded product.

5.3.5 Imprinters:

These are the small flexo unit having rubber plates for printing on the printed web. These are needed along with the web offset machine because if we are printing a large quantity of a product but retailers address alone changed for a particular quantity and so on. So, for printing these matters for a particular and particular quantity of papers these imprinters are used.

The imprinters are normally having two plate cylinders by which one is used for printing and the next make ready for next one is matter printing.

Web tension:

A constant pulling force carried on the reel paper from the infeed section to the feeding area is called as web tension.

Cut off:

Cut off determines the image position on the signature along the length of the web. The circumference of the plate cylinder determines cut.

Cut off length:

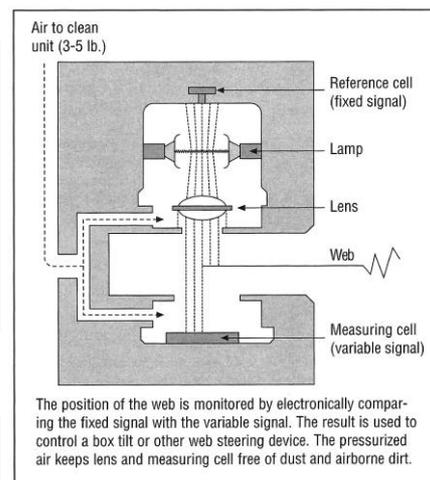
- The distance between corresponding prints of repeated images on a web.
- The circumference of the plate cylinder.

Template:

This is a patterned thick metal plate, which is used to tear the leading edge of the web in a particular pattern over this patterned paper edge the double side adhesive tape pasted in various areas. This pattern is produce on the paper edge and tape is pasted in various areas in order to increase the contact area between two web rolls during splicing operations.

Sidelay sensor:

This is an 'U' shaped apparatus. This device is fixed before the printing unit (in the infeed section) for correct print registration control and before the folding unit for correct folding of the web.



Construction:

These devices consist of a light sensor at one arm and a receiver at the next arm. The light source receiver is provided in a manner that while it passes the light on the web, the light rays are partly blocked by the web of paper and the remaining rays are received in the receiver. According to the strength of the signal received by the receiver, the web steering device gets activated to adjust the position of the web in sideways for correct printing and folding.

QUESTIONS

UNIT - V

PART – A (Two Marks Questions)

1. What is a drier?

Drier is used to dry the ink on the printed web.

2. What are the types of driers?

Open flame drier, high velocity hot air drier and combination drier.

3. What is a chill roll?

Chill roll is used to retain the moisture over the paper after it comes from the drier.

4. What are the types of chill rolls?

Earliest chill roll, baffle plate chill roll and jacketed chill roll.

5. What are the different types of folder?

Different types of folders are Combination folder, Ribbon folder and double former folder.

6. What are the principles of folding?

Folding principles are Former folding, Jaw folding and chopper folding.

7. What are the mechanics of folding?

Former folder, Jaw folder and chopper folder.

8. What is cut off and cut off length?

The distance between the corresponding point of repeated images on web is called cut off. The distance between the lengths of the repeated image on the plate is called cut off length.

9. What is R.T.F. roller?

RTF means Roller Top of the Former board on web offset machine.

10. Why air-blowing holes are present in the former board?

Air blowing holes are to suck and pass the web.

11. What is a guide wheel?

It is used to guide the paper coming from former board in to the tripping roller.

12. What is nipping roller?

Nipping roller is present below the former folder. It is used to pull the folder web coming from the former board.

13. What is perforation?

Perforation is used to produce series of holes on the printed web for easy tearing.

14. What is sheeter?

Sheeter is used to cut the printed web into the single sheets.

15. What is stacker?

Stacker is used to stack and count the folded papers.

16. What is bundler?

Bundler is used to tie the folded signature for delivery.

17. What is the purpose of side lay sensors?

Side lay sensors are used to activate the sidelay for correct placements of image.

18. What is the use of imprinters?

Imprinters are small flexo unit used to give printing on the printed web.

19. What are the ancillary devices (auxiliary equipments used in web offset presses)?

Ancillary devices are Perforators, bundles, perforators and imprinters.

20. What is the other name for open flame driers?

Open flame driers are also called as direct impingement drives.

PART – B (Three Marks Questions)

1. Write about open flame drier with neat sketch.

This is the oldest type of dryer. In this type the flame is directly fall over the web from nozzles attached in particular angle. These nozzles are attached from a particular distance from the web to avoid fire creating on web. The disadvantage of these dryer is that it completely absorbs the moisture present in the web of paper.

2. Write about high velocity drier with neat sketch.

High velocity drier blows hot air over the web for drying the ink. The nozzles are present for blowing hot air. Between the nozzles exhaust ducts are present to vent the blowed hot air to maintain uniform hot air formation.

3. Write about combination drier with neat sketch.

The combination dryers use the combination of open flame as well as the hot air dryers. In this type the web first passes through open flame type and next through the hot air blower nozzles. Due to these types the ink on the web goes to quickly dried.

4. Explain about baffle plate chill roll with neat sketch.

In this design the centre of the chill roll have enough. Chilling temperature and the ends of the rolls doesn't have proper cool temperature. This is because of uniform presence of water in the ends. So the edges of the web also don't set uniform chillness

5. Explain about jacketed chill roll with neat sketch.

Jacketed Chill Rollers was constructed as a jacketed chill roll. Inside the chill roll box a void is provided the water is supplied between the thin sheets of void end chill roll inner surface.

6. Explain about former folder with neat sketch.

This fold is done on the paper in its grain direction in this folder a large triangular polished metal board consist of a sharp nose guide and nipping rollers. The folding is made when the web passes over this former board and between guide and nipping rollers.

7. Explain about jaw folder with neat sketch.

This fold is done across the grain direction of paper. In this type after the web gets folded in the former folder. The web passes between the cutting blade shaft and a folding cylinder. In this place the web gets cut in the required place. Then it is carried around the folding cylinder by a series of pin mechanism.

8. Explain about chopper and ribbon.

Chopper is the quarter or final folder at the machine. After the second folding the paper sees to the paper area with its folded edge. Moving forwards in the chopper folding area the folded paper gets blocked in a mechanism and its centre area is pushed between uniform two rollers by using a knife mechanism. Thus the final folding is done. In this folder former fold is not present the paper web is slitted into several ribbons by using slitting wheels over the top of the metal roller. Then the slitted web of ribbons is turned in different angles by using turner bar mechanism. These ribbons are than combined with one another and cut by using cutting mechanism and the finally combined signatures are folded by using jaw folding mechanism to obtain finished signature.

9. Explain about stackers and bundlers.

Stackers are the devices which count the group of folders signatures and they are having rotating table which rotates for about 180 degree in order to position alternative placement of folded signatures. This rotation helps to correct placing of folded edges without bulge at any one side. After the stackers the folded signatures reaches a sealing mechanism. The sealing device seals the stacked signatures by a plastic transparent paper and transparent the sealed counted products to bundling device. The bundling device ties the sealed products with straps tightly and delivers the bundler products for dispatching.

PART – C (Ten Marks Questions)

1. Explain the types of dryers with neat diagram.
2. Explain the types of chiller rollers with neat diagram
3. Explain the principles of former folder and jaw folders with neat diagram?
4. Explain the mechanics of folding with diagram?
5. Explain the types of folders with sketches?
6. What are the auxiliary equipments? And explain Stakers and sheeters with neat sketch.
7. What are the ancillary equipments? And explain Bundlers and Perforators with neat sketch.
8. What is Imprinter? And explain the purpose of imprinter with neat sketch