Offset Lithography

lithography means: writing with stones

based on the principle that water and oil do not mix
History

Artisans inscribed on flat stones using an oily ink & used that stone as a printing plate.

Images were carried on the stone by keeping water in the non-image areas, therefore, keeping the ink to stay in the image areas.
History
modern lithography plates work using the same basic principle, ink receptive coating on the plates is activated only on the image areas.

40–60% of printing jobs are done using offset lithography.
History

In 1906, the first “offset” press began running in Nutley, NJ

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in 1906, the first "offset" press began running in Nutley, NJ. Ira A. Rubel, a paper manufacturer, discovered the process by accident.
an image on a plate cylinder was accidently transferred to a rubber blanket on the impression cylinder and then onto a piece of paper running through the press

the result was a crisp, sharp image
Offset Lithography

b/c this method uses the offset principle, it is simply called offset printing
History

A.F. Harris of the Harris Automatic Press Company in Niles, OH had a similar experience that same year.
History
most prevent ink from traveling to the non-image areas by using a water based solution
other modern plate techniques called **waterless printing** using

an ink repelling coating in the non-image areas made of such substances as silicone
offset lithography

waterless advantages:

reduces makeready
press easier to control
permits screen rulings up to 1000 dpi
digital (filmless) plate making
Offset Lithography

http://coloursdigital.com/printing/waterless-printing/
Offset Lithography

waterless disadvantages:

plates more expensive
plates wear out faster
proofing systems are currently designed
to predict water based process
Press Sizes, Types & Features

*sheetfed:* one sheet at a time
Press Sizes, Types & Features

**web:** paper fed from rolls
typical sheetfed sizes:

12" x 18": small press, finished size 11" x 17", letterhead, business cards, fliers, envelopes, and forms

19" x 25"
23" x 35"
25" x 38"
55" x 78"
Press Sizes, Types & Features

5 typical web press sizes:

form web: 8.5”– 10” roll
mini web: 11”– 14” roll
half web: 17”– 20” roll
three quarter web: 22”– 27”
full web: 35”– 40” roll
web press sheet length is determined by the circumference of the cylinder

ex: a plate cylinder with a 23" circumference printing to paper 35" wide will produce a cut sheet of 23" x 35"
Press Sizes, Types & Features

web presses rarely stop once running unless the web (paper) breaks

paper then has to be re-threaded through the machine, an expensive and time consuming process
web presses from the Heidelberg website
Press Sizes, Types & Features

many web presses can do standard folds and binding in line for complicated direct mailers and brochures
Press Sizes, Types & Features

sheetfed or web?

most times, your printer will determine this for you. The economic feasibility of either type of press is determined by the shop.
Press Sizes, Types & Features

web may work best:

- basis weight is under 50#
- paper is relatively inexpensive
- stock in newsprint
- number of impressions is over 25,000
- can print both sides at once
- standard folds and binding in line
Press Sizes, Types & Features

sheefed may work best:

- basis weight is over 70#
- need showcase quality
- paper is relatively expensive
- shorter run
Press Components

5 basic components:

- feeding units
- register units
- inking units
- printing units
- delivery units

most presses also have a water unit: brings dampening solution to the plate
feeding units:
deliver paper into machine

feeding units
register units
inking units
printing units
delivery units

delivery units:

sheetfed
Press Components

feeding units: deliver paper into machine

web
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

register units: assure paper arrives in the same place repeatedly in the printing units
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

Sheetfed presses: one sheet at a time and position it for printing. Each sheet must be in the exact same position for good register.
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

inking & dampening units: conveys liquid to the plates
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

ink is pasty, the consistency of honey
press operators control ink flow onto the rollers
ink rollers transfer ink from fountain to the plate
can decrease or increase flow to sections of the plate
Press Components

feeding units
register units
inking units
printing units
delivery units

rollers work to smooth ink and spread evenly across the plate to achieve uniform density
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

small presses may have:
- 1 ink fountain with
- 10 – 12 outlets,
- 4 – 5 rollers per plate

large presses may have:
- 8 ink fountains with
- 50 – 60 outlets,
- 18 – 20 rollers per plate
Press Components

presses that use dampening fluids: protect the non-image areas of the plate
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

plate must receive enough water to prevent ink from adhering to the non-image areas too much and the water may transfer to the blanket or paper
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

Dampening solution must evaporate immediately, leaving only a thin film of ink on image areas.

Offset printing depends on a balance between ink and dampening solution.
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

Dampening fluid contains:
- a base of water
- acids
- gum arabic
- alcohol
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

**Printing units:**
transfers images to paper

**Consists of:**
a series of cylinders and rollers that transfer the inked image to the paper
Press Components

feeding units
register units
inking units
printing units
delivery units

typical printing unit configurations:
  1 color press = 1 unit
  two-color press
  four-color press
  six-color press
  eight-color press
after the feeding unit pulls the sheet in to position: grippers pull it into the printing unit

impression cylinder presses against the blanket cylinder
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

**gripper edge of paper:** leading edge that enters the printing unit first

**gripper holds 3/8” on this edge of the paper:** cannot ink in this area
Press Components

impression cylinder presses against the blanket cylinder
blanket cylinder transfers the ink to the paper
when the press is in operation, image register is adjusted by moving the plate cylinder
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units
impression:

each time a sheet on a sheetfed press or finished sheet cutoff length on a web press passes through a press
Press Components

feeding units
register units
inking units
printing units
delivery units

iph:

press speeds are measured in number of impressions per hour
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

**perfecting press:**

can print both sides of the paper through the same pass through the machine

some print both sides simultaneously, some turn the paper over to print the other side
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

**delivery units:** removes printed paper

(sheetfed)
Press Components

feeding units
register units
inking units
printing units
delivery units

exit wheels, which touch the printed sheet, must not mark areas of heavy coverage
Press Components

- feeding units
- register units
- inking units
- printing units
- delivery units

The diagram illustrates the process of web-fed delivery. The paper roll is unwound, and the web passes through the impression cylinder, where cutting blades strike the web, resulting in the proper lengths. The cut-off cylinder then cuts the web into specific lengths as it passes between the two cylinders.
Press Components

- Feeding units
- Register units
- Inking units
- Printing units
- Delivery units

Web-fed Delivery: Roll to Roll

Unwind Direction

Paper Roll

Rewind Unit: The paper web is wound onto a spool after printing.
Press Components

may include a unit that sprays a fine powder known as “anti-offset powder”

prevents the ink from the front of one sheet from transferring to the back of another
unwanted ink transfer is called **offsetting** or **setoff**

more likely to occur when using gloss coated paper with good ink hold-out (ink sits more on top of paper due to coating)
Other Types of Printing

- Letterpress
- Engraving
- Flexography
- Gravure
- Screen Printing
- Digital Printing