OFFSET LITHOGRAPHY

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

The image can be printed directly from the stone plate (the orientation of the image is reversed)
Lithography uses simple chemical processes to create an image. The positive part of an image is a water-repelling ("hydrophobic") substance, while the negative image would be water-retaining ("hydrophilic").

Invented in 1796

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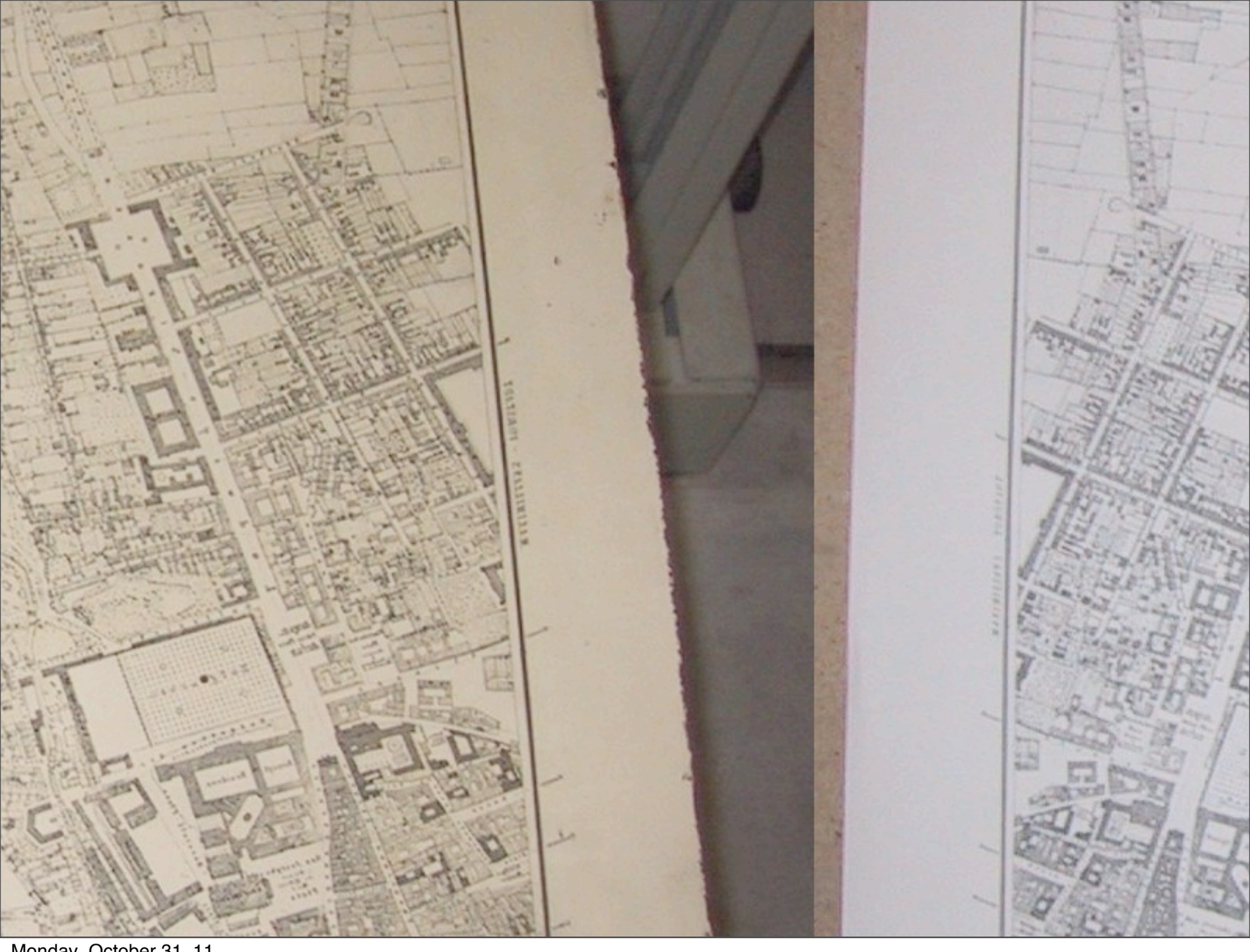

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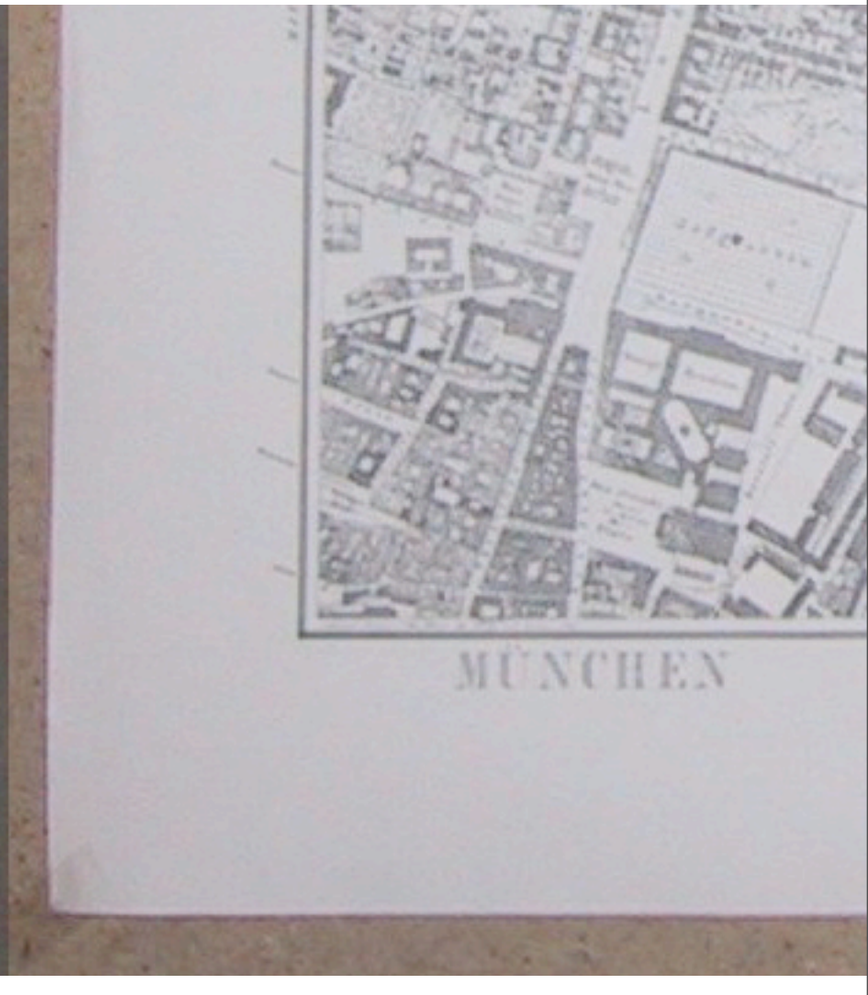
Artisans inscribed on flat stones using an oily ink or grease and used that stone as a printing plate.



The image can be printed directly from the stone plate (the orientation of the image is reversed)

Modern lithography plates work using the same basic principle, ink receptive coating on the plates is activated only on the image areas.

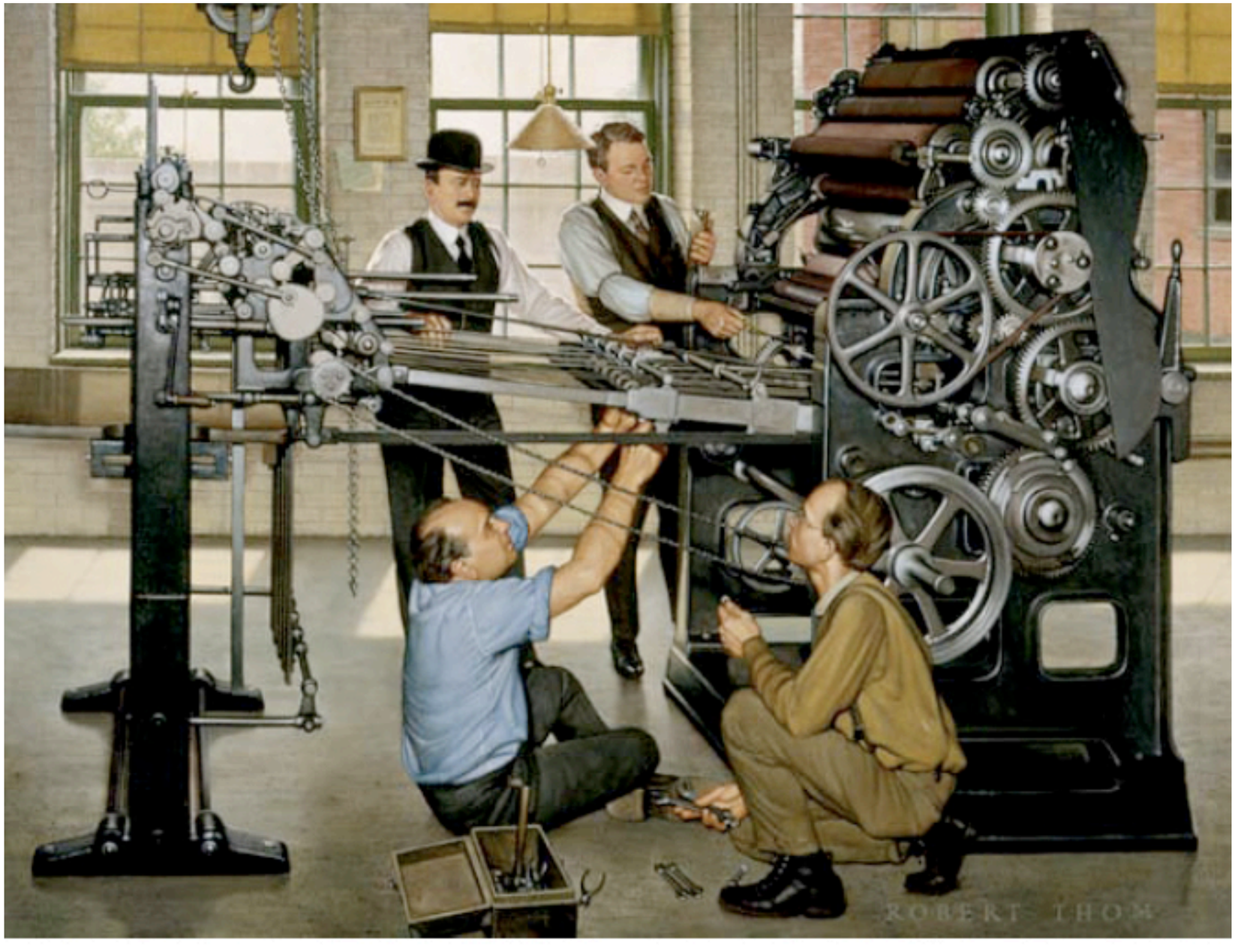
40–60% of printing jobs are done using offset lithography.

Modern plates are primarily made of metal.

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

Ira A. Rubel, a paper manufacturer, discovered the process by accident.

A.F. Harris of the Harris Automatic Press Company in Niles, OH had a similar experience that same year.



Ira Rubel and the Offset Press by Robert Thom

An image on a plate cylinder was accidentally 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.

Because this method uses the offset principle, it is simply called offset printing.

This discovery established four important advantages in lithography.

The rubber blanket conforms to irregular printing surfaces. This results in the need for less pressure and improved print quality of text and images on rough paper surfaces.

The paper does not contact the printing plate. This increases the plate life and raises the number of possible impressions.

The image on the plate is right reading not reverse reading.

Less ink is required for equal coverage which speeds up drying time and reduces smudging and set-off.

Set off is when ink transfers from the front of one sheet to the back of another. Usually with coated high gloss papers that have good ink hold out.

PLATES

Modern lithography is a planographic process using mostly thin metal plates. The image and non image areas existing on the same plane.

The plates are pre-coated with a light sensitive material. The image areas are then created either with a positive or negative image from film generated from your digital file. The image can also go direct from computer to plate.

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Computer to Film

Similar to a contact proof you made in the dark room in basic photography.

A CTP platesetter uses a laser to change the coating on the plate either physically or chemically. There are two main types of CTP platesetters, thermal and visible light - referring to the type of laser technology used. Thermal CTP technology changes the plate physically by either hardening the image areas or removing the non-image areas (known as ablation). Visible light CTP technology, commonly referred to as violet CTP, changes the plate chemically and the coating in the non-image area is washed from the plate.

Most printers prevent ink from traveling to the non-image areas by using a water based solution that usually includes alcohol, acid, and natural and synthetic gums.

Gum arabic being the most common.

There is are also waterless plates which use an ink repelling coating in the non-image areas made of such substances as silicone.

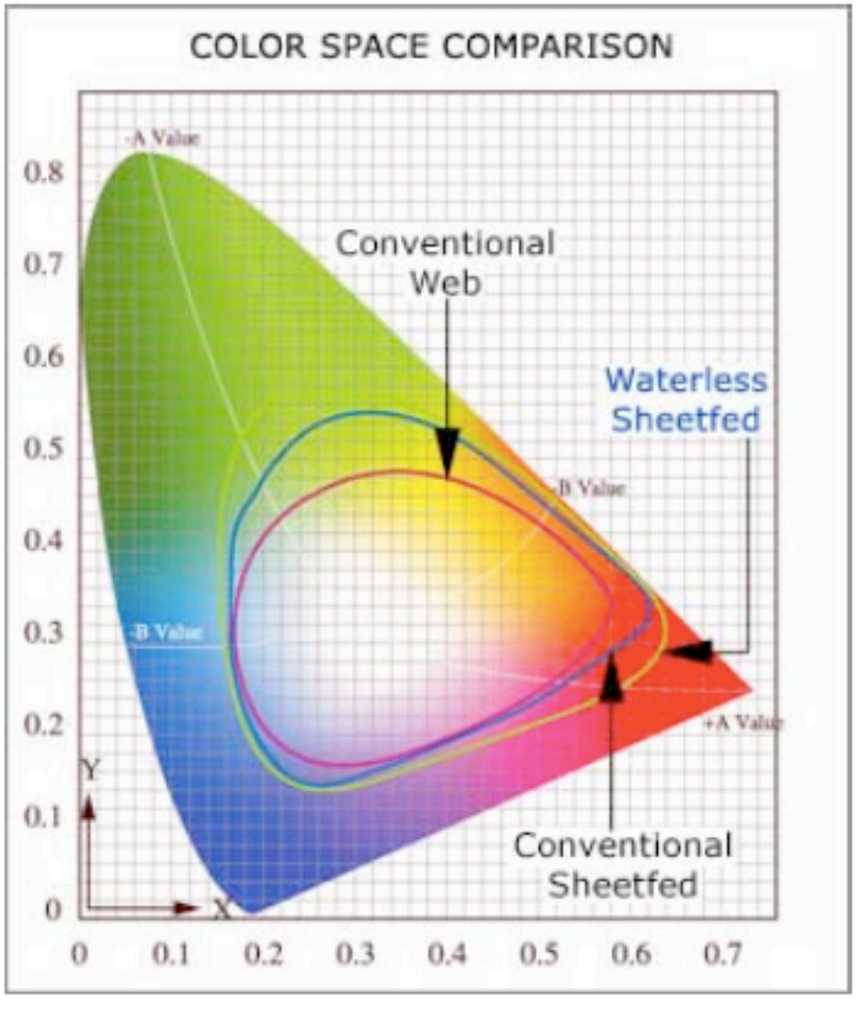
The temperature of the inks must be strictly controlled to maintain the correct viscosity because the plate surface is designed to repel inks of a specific viscosity.

Since there is no water ink balance to maintain waterless printing has the potential to:

Reduce makeready

Make it easier to control the press

The process also permits much higher resolution and is direct to plate or computer to plate instead of film.



Prints by Waterless Plate

Prints by Conventional Offset Plate

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

PRESS TYPES

Sheet-fed: One sheet at a time

Web: Paper fed from rolls

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Sheet Fed

Typical sheet-fed 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"

A 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.

work and turn

work and tumble

Web Fed

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"

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Web Fed

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.

Many web presses can do standard folds and binding in line for complicated direct mailers and brochures.

Sheet-fed or Web?

In most situations, your printer will determine the economic feasibility of either type of press.

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

Sheet-fed may work best:

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

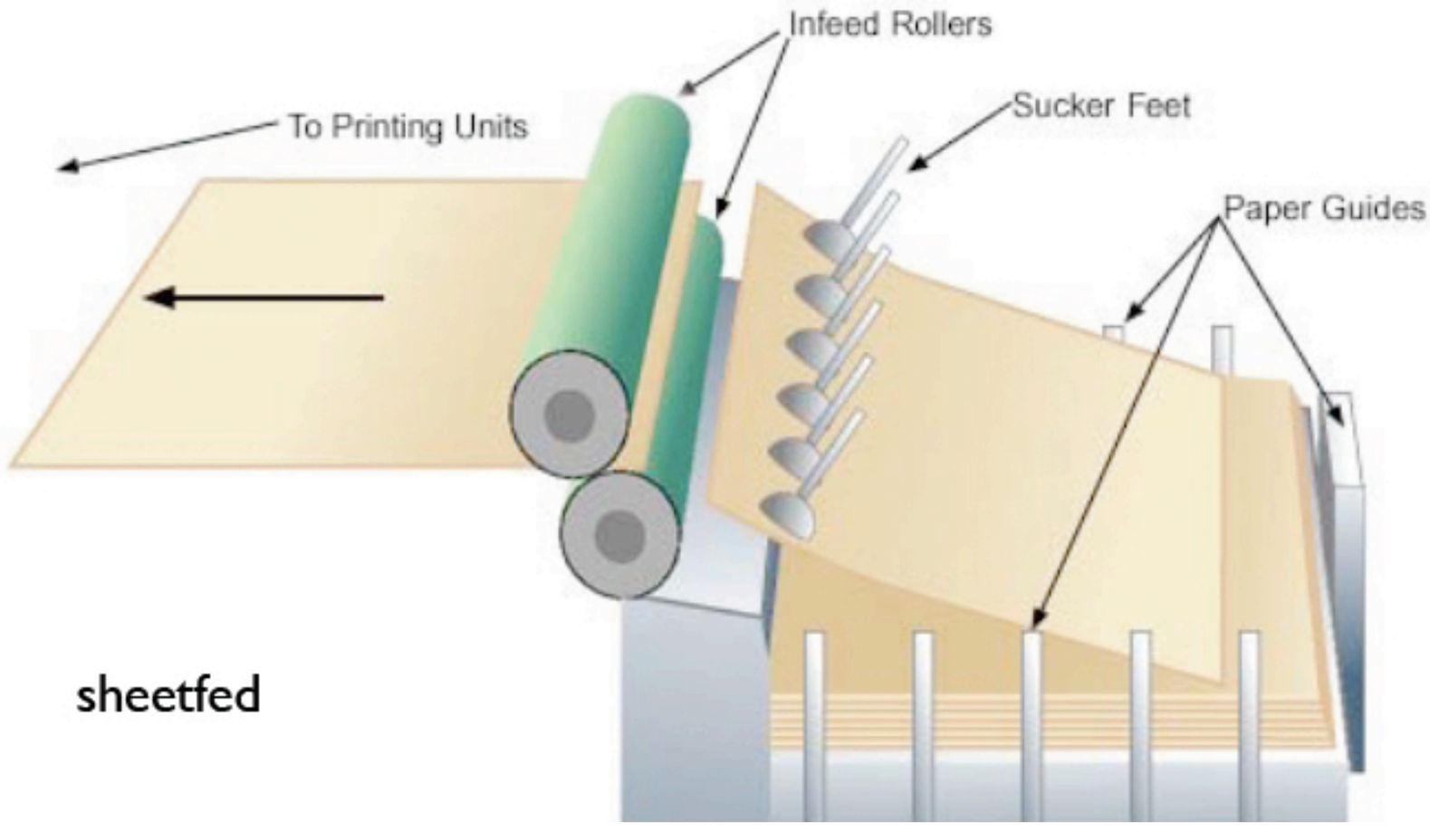
PRESS COMPONENTS

5 basic components:

feeding units
register units
inking units
printing units
delivery units

A majority of presses also have a water unit which brings dampening solution to the plate.

Feeding units deliver paper into machine.



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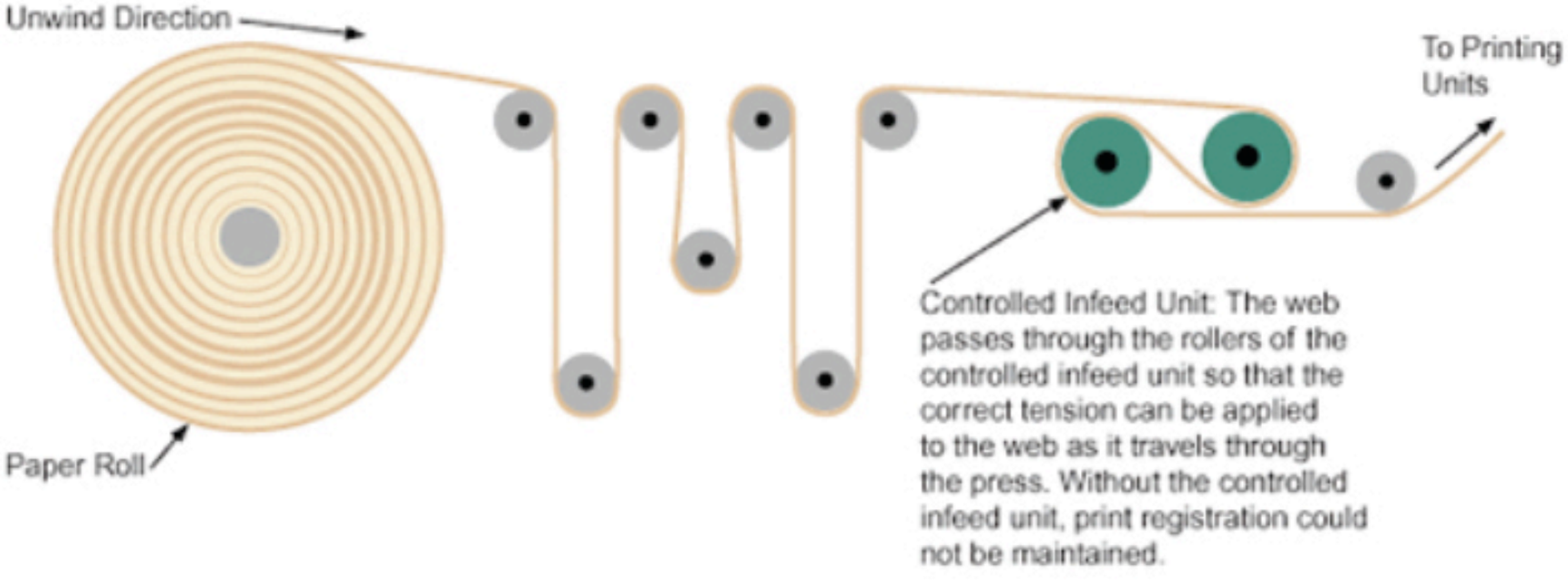
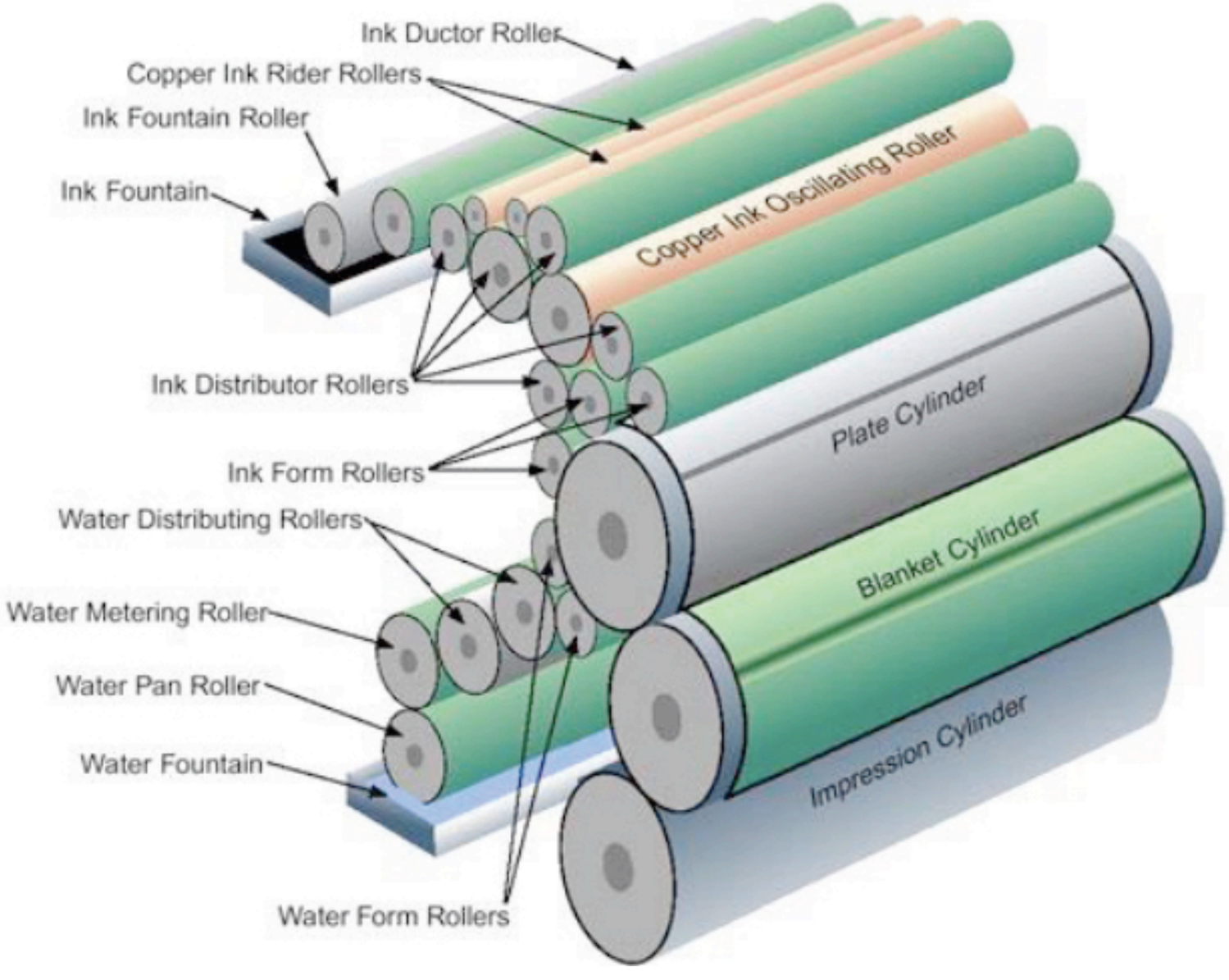


web

Register units assure paper arrives in the same place repeatedly in the printing units.

Sheet-fed presses: one sheet at a time and position it for printing each sheet must be in the exact same position for good register.

Inking & dampening units conveys liquid to the plates.



Ink is pasty, the consistency of honey.

Ink rollers transfer ink from fountain to the plate.

Rollers work to smooth ink and spread evenly across the plate to achieve uniform density.

Press operators control ink flow onto the rollers.

Press operators can decrease or increase flow to sections of the plate.

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

Large presses may have:
8 - 10 ink fountains with
50 – 60 outlets,
18 – 20 rollers per plate

Presses that use dampening fluids protect the non-image areas of the plate.

The plate must receive enough water to prevent ink from adhering to the non-image areas.

If the plate receives too much water it may transfer to the blanket or paper.

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.

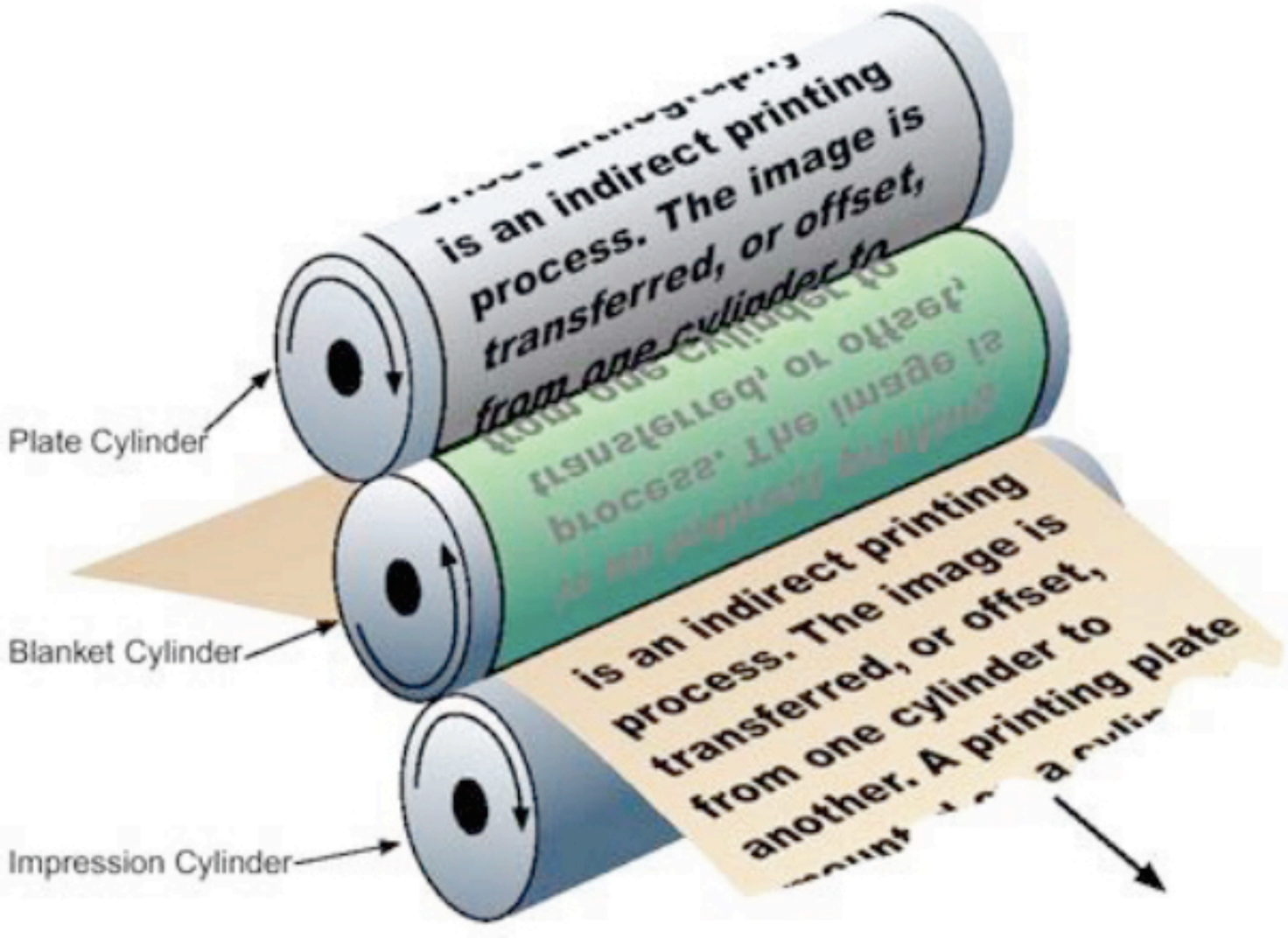
a base of water

acids

gum arabic

alcohol

Printing units consist of a series of cylinders and rollers that transfer the inked image to the paper.



Typical printing unit configurations:

1 color press = 1 unit

two-color press

four-color press

six-color press

eight-color press

After the register unit pulls the sheet in to position grippers pull it into the printing unit.

The impression cylinder presses against the blanket cylinder and then the blanket cylinder transfers the ink to the paper.

When the press is in operation, image register is adjusted by moving the plate cylinder.

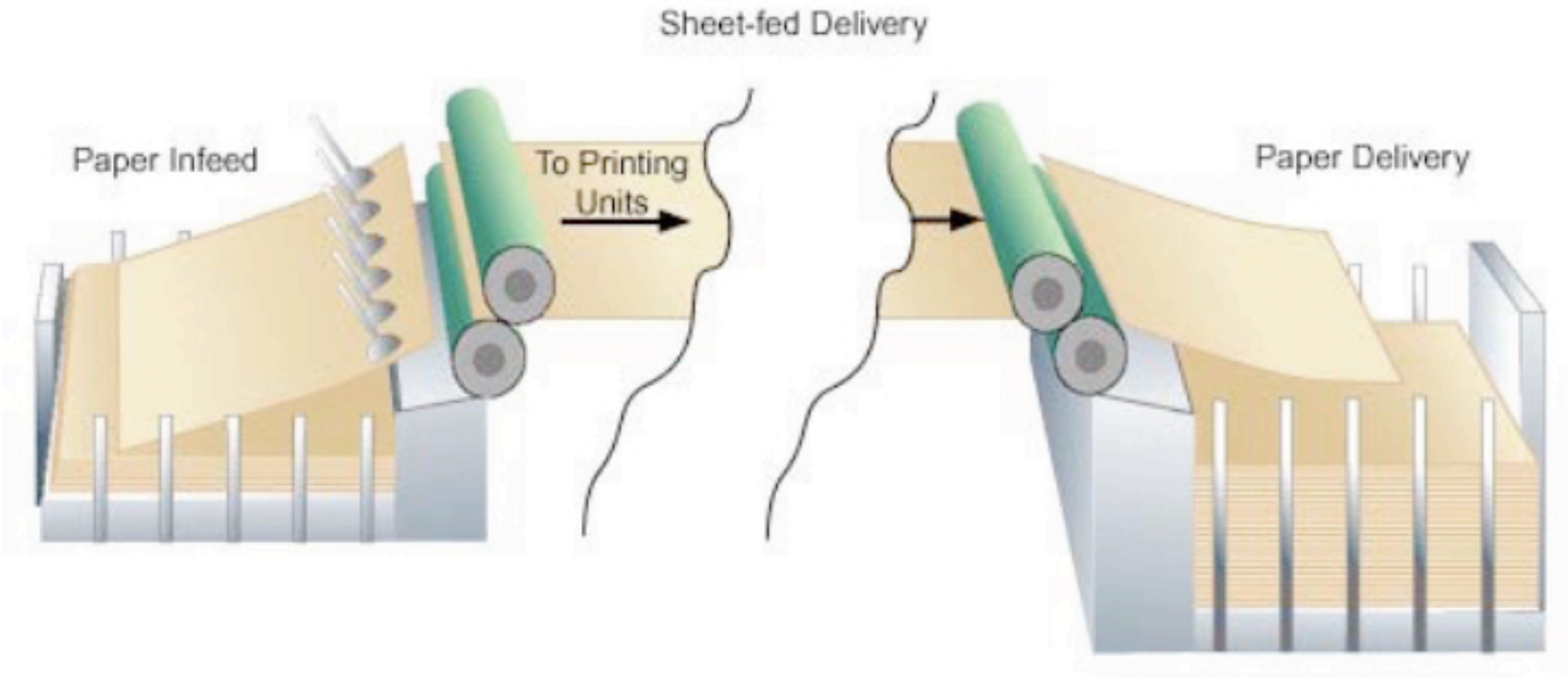
The gripper edge of paper is the leading edge that enters the printing unit first.

The gripper holds 3/8” on this edge of the paper
and you cannot ink in this area.

An impression is each time a sheet on a sheet-fed press or finished sheet cutoff length on a web press passes through a press.

Press speeds are measured in the number of impressions per hour or IPH.

Delivery units remove the printed paper from the machine.



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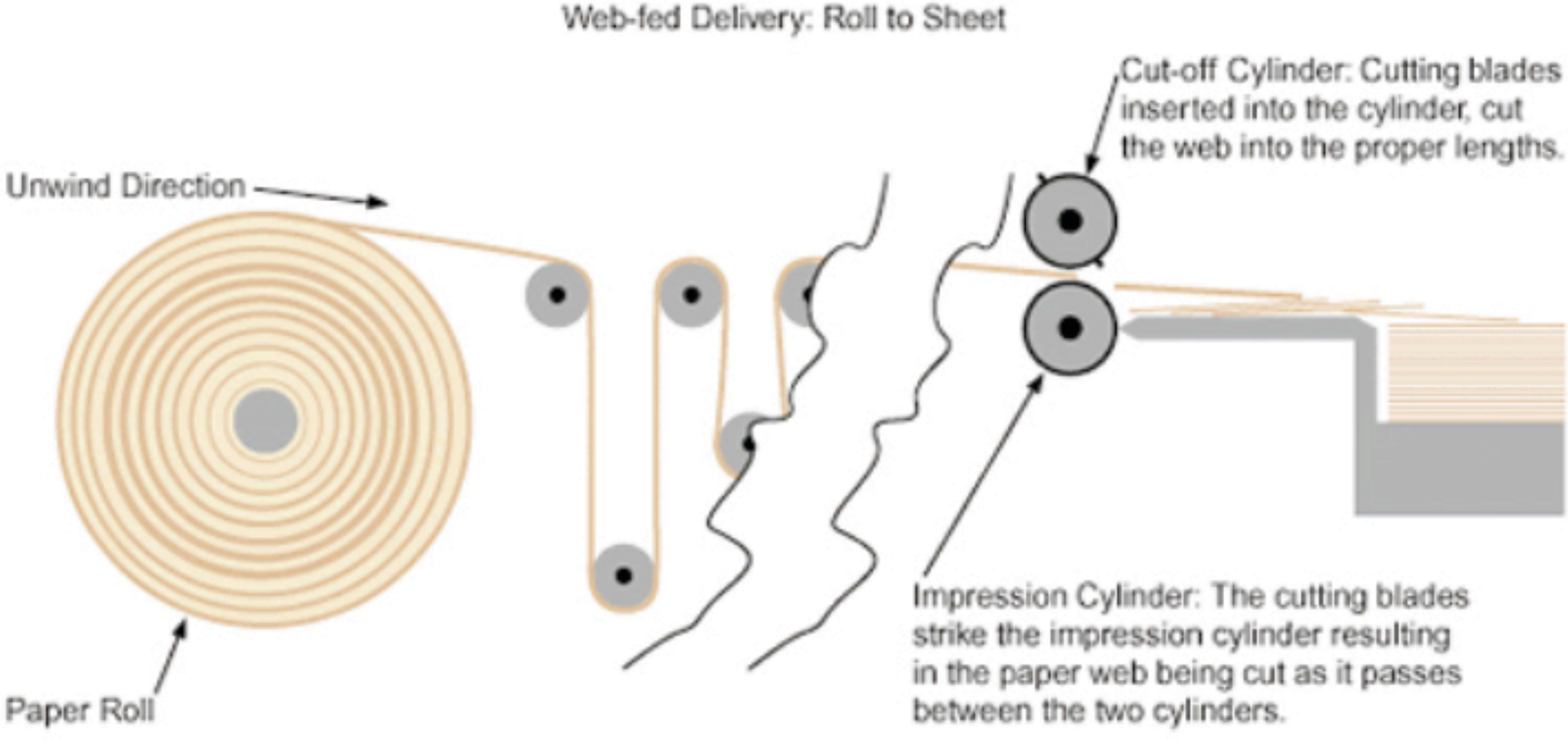

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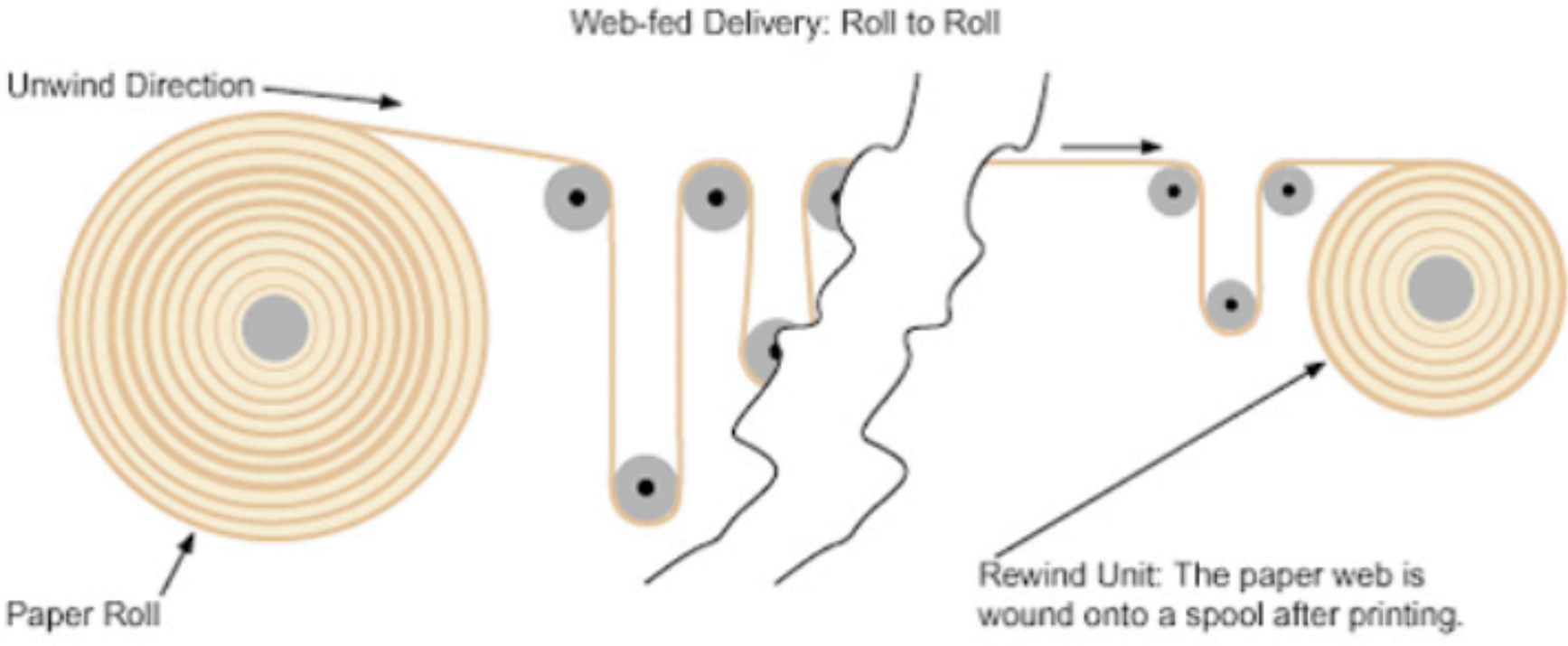

A press may include a unit that sprays a fine powder known as “anti-offset powder” prevents the ink from the front of one sheet from transferring to the back of another.