

# 印刷基础知识

## Printing Brief introduction

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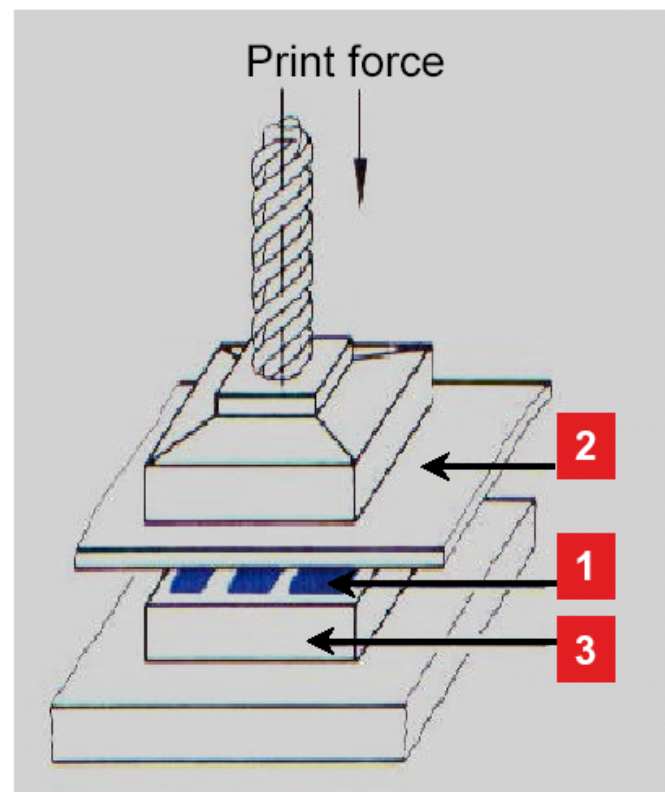
2014年10月25日

## 二、印刷概述

### What is printing?

#### Printing is:

Reproduction, for the multiplication of information were (Picture and/ or text) **printing ink (1)** transformed on a **substrate (2)** by the use of a **printing forme (3)**. On the printing forme is the image placed or stored.



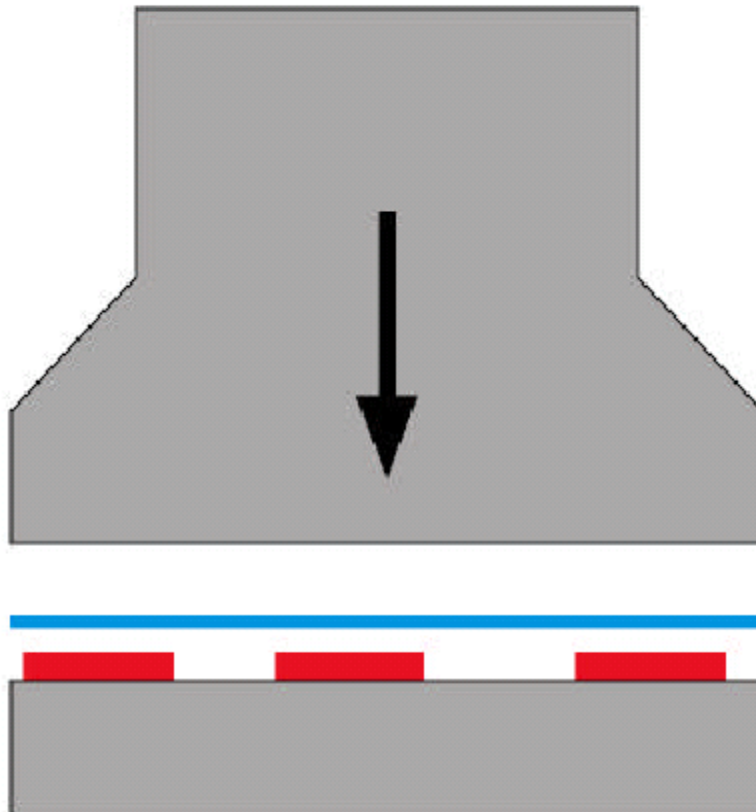
# 印刷的传统定义

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- 以**原稿**为依据，制成**印版**，再在印版上敷上粘附性**色料**，在**机械**压力的作用下，使印版上一定量的粘附性色料转移到**承印物**上，得到批量印刷品的技术。



# The Factors of Printing



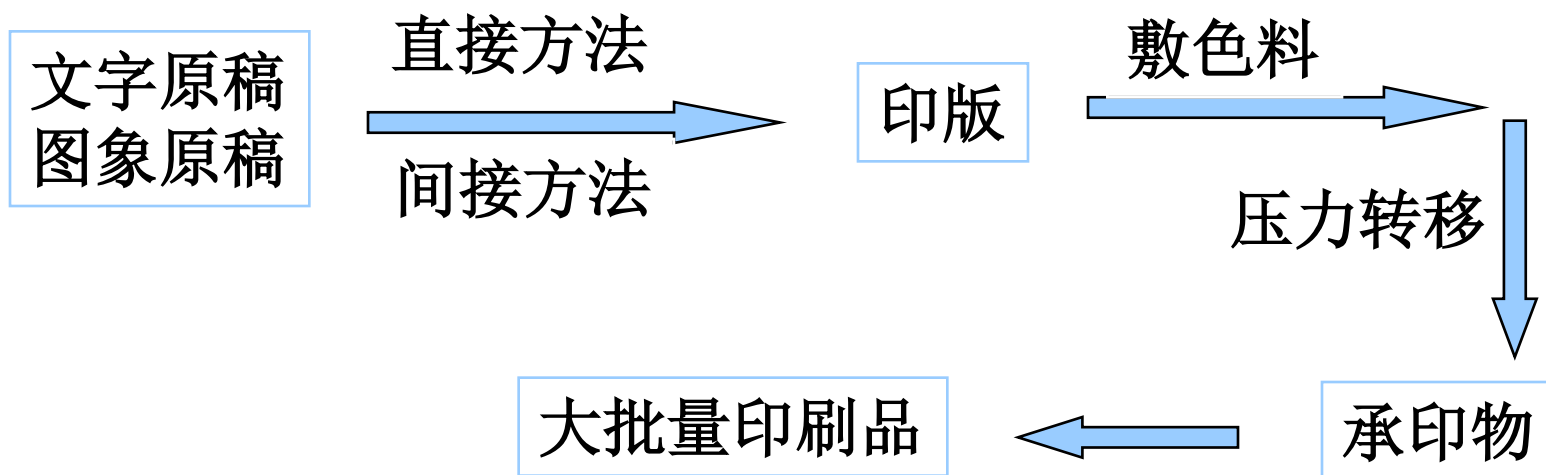
Pressure

Substrate

Ink

Printing forme

# • 印刷的传统定义



**广义印刷：**制版 + 印刷 + 印后加工

**图像传播：**信息的可视化和传递(**Graphic Communications**)

**狭义印刷：**印版上图文信息部分所粘附的色料转移到承印物表面的工艺技术。

压力原理是传统印刷的基础



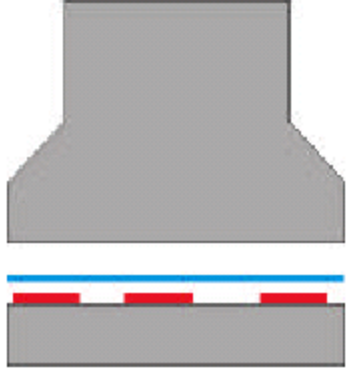
# The Sequences of Printing



Feeding



Inking



Printing



Delivering

## 有些新的印刷方法

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- 不需要印刷压力  
例如：静电印刷，喷墨印刷，
- 不需要印版  
例如：有的直接印刷（CTP）

故：印刷是以一定的方法对原稿图文进行大量复制的技术。

印刷是一种最基本，最大众化的信息传播和存储方法。



# 印刷的定义

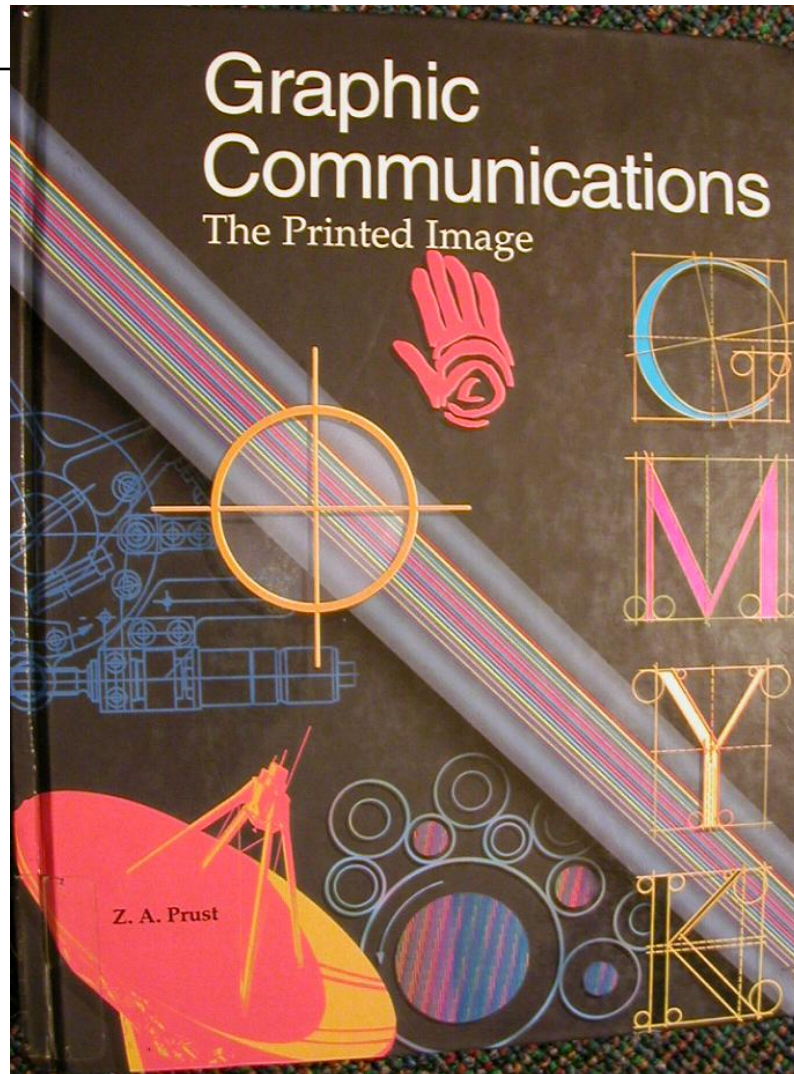
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- 广义的印刷，实际上是制版、印刷、印后加工的总称。
- 狭义的印刷仅指将印版上的图文信息所粘附的色料转移到承印物表面的工艺技术。





# Graphic communications



# 印刷的五要素

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- 常规的印刷，必须具备有以下五大要素：
  - 原稿
  - 印版
  - 承印物
  - 印刷油墨
  - 印刷机械



# 原稿 (original)

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- 文字原稿  
手写稿、打印稿、复制稿等。
- 图像原稿  
绘画原稿、照像原稿等。
- 实物原稿  
以实物作为制版依据。
- 数字化原稿

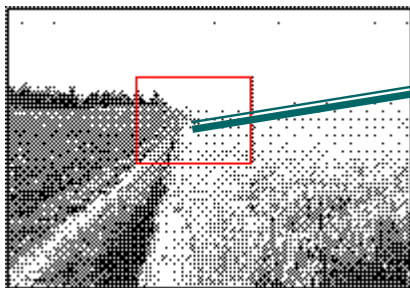


# 印版 ( plate )

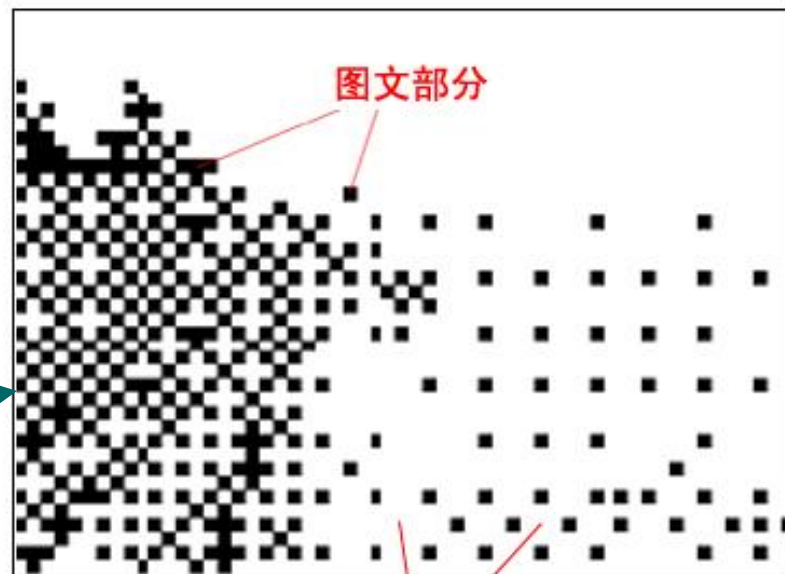
印版是用于传递油墨至承印物上的印刷图文载体。



黑版数据



半色调图像



图文部分

空白部分

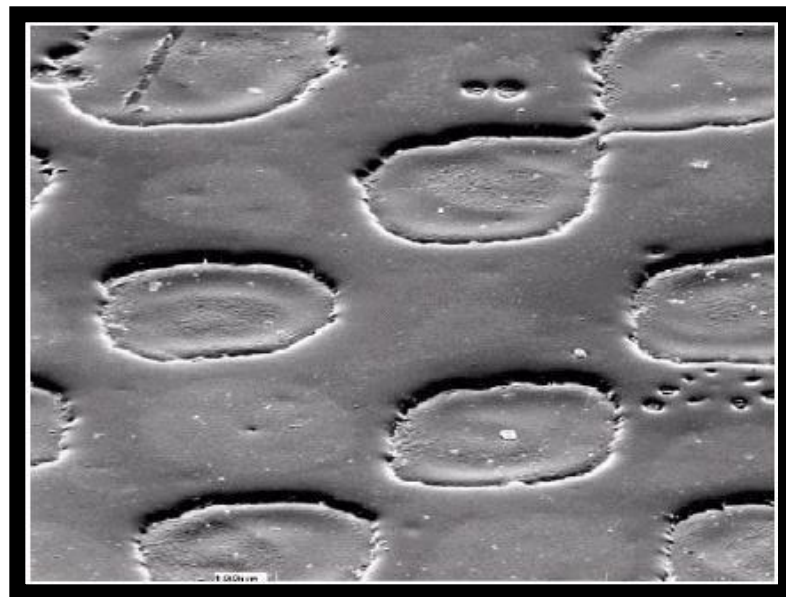


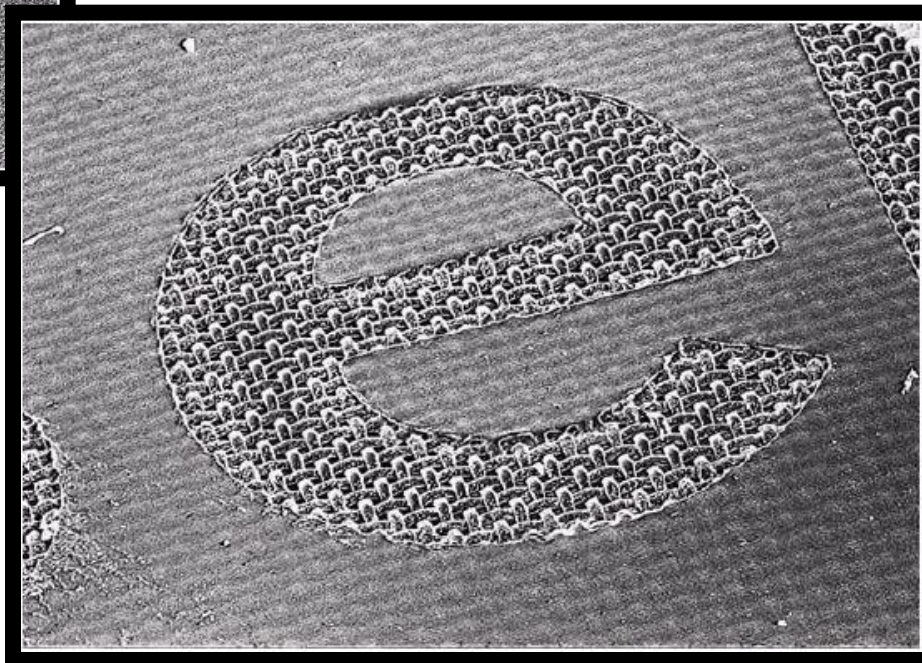
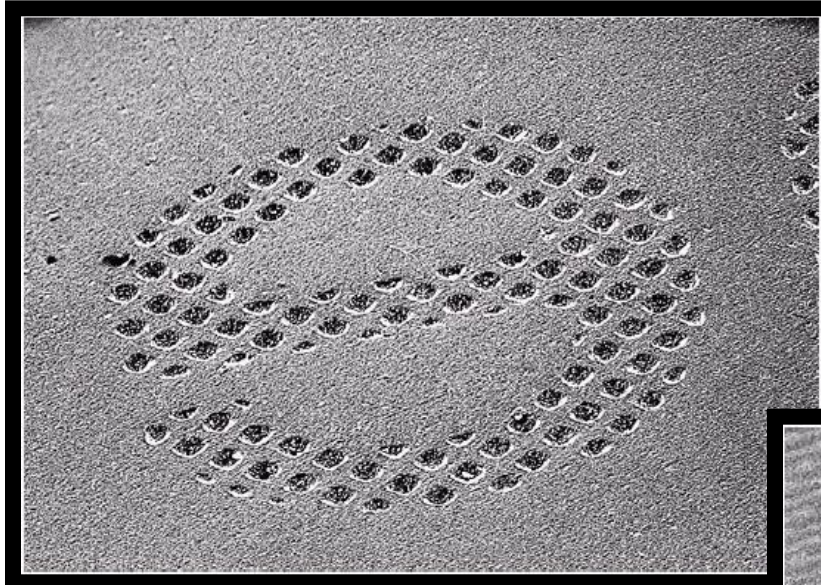
# 印版的分类

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- 印版按照图文部分和空白部分的相对位置、高度差别或传递油墨的方式，被分为凸版、平版、凹版和孔版等。
- 用于制版的材料有金属和非金属两大类。







# Printing Processes

## Selection criteria

- Run length
- Printing quality
- Plate costs
- Stock costs
- Special effects

## Where is the ink?



Gravure



Offset



Letterpress/  
Flexo



Screen

## What is the result?

Catalogs, magazines,  
long runs

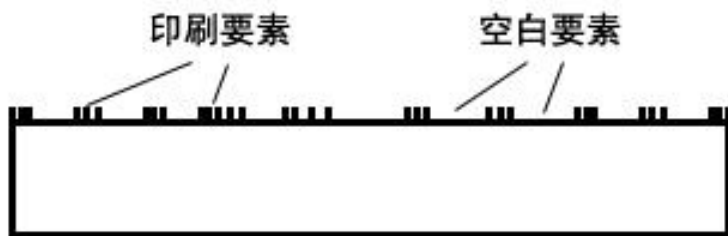
Packaging, commercial  
printing, magazines,  
labels, medium runs

Cards, embossing, items  
for personal use

Poster, textiles, glass,  
plastics, short runs



# 印版的特点



- 平版印刷的印版，印刷部分和空白部分无明显高低之分。

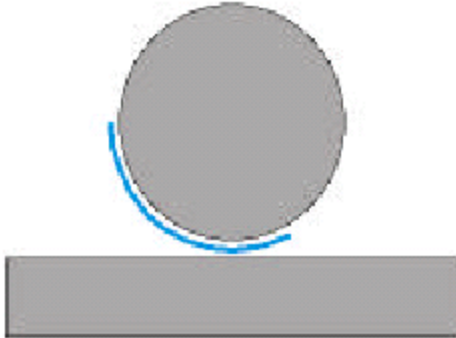
- 凸版印刷的印版，其印刷部分高于空白部分，而且所有印刷部分均在同一平面上。



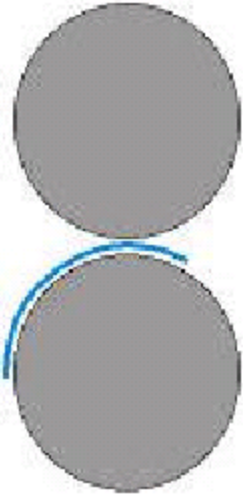
# Principle of Printing



Flat/Flat



Cylinder/Flat



Cylinder/Cylinder

# 印版的特点

- 凹版图文部分低于空白部分，而凹陷程度又随图像的层次有深浅不同，图像层次越暗，其深度越深。



- 孔版图文部分是由大小不同的孔洞或大小相同但数量不等的网眼组成，孔洞能透过油墨。



# 承印物

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- 承印物是接受印刷油墨或吸附色料并呈现图文的各种物质。
- 传统的承印物为纸张（**paper**）。
- 目前用量最大的是纸张和塑料薄膜。
- 其它：纤维织物、塑料、木材、金属、玻璃、陶瓷等等。



# 印刷油墨（printing ink）

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印刷油墨是在印刷过程中被转移到承印物上的成像物质。



# 油墨的主要成分

油墨	主剂	颜料	有机颜料 色淀性颜料 无机颜料
		连结料	油型连结料 树脂型连结料 有机溶剂
	助剂	流动性调整剂	粘度调整剂 粘着性调整剂 防脏剂
		干燥性调整剂	干燥剂 干燥抑制剂
		色调调整剂	冲淡剂 提色剂



# 油墨中各成份的作用

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- 颜料是油墨中的固体成分，为油墨的显色物质，一般是不容于水的色素。油墨颜色的饱和度、着色力、透明度等性能和颜料的性能有着密切的关系。
- 连结料是油墨的液体成份，颜料是载体。墨膜的光泽、干燥性、机械强度等性能和连结料的性能有关。
- 油墨中添加的助剂，是为了改善油墨的印刷适性，如：粘度、粘着性、干燥性等。



# 油墨的分类

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- 凸版印刷油墨：书刊黑墨，轮转黑墨，彩色凸版油墨等；
- 平版印刷油墨：胶印亮光树脂油墨，胶印轮转油墨等；
- 凹版印刷油墨：照相凹版油墨，雕刻凹版油墨等；
- 孔版印刷油墨：誊写版油墨，丝网版油墨等；
- 特种印刷油墨：发泡油墨，磁性油墨，荧光油墨，导电性油墨等。





# 印刷机械（printing machinery）

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- 印刷机械是用于生产印刷品的机器、设备的总称。它的功能是使印版图文部分的油墨，转移到承印物的表面。



# 印刷机械（printing machinery）

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- 按照版面型式分为：凸版印刷机，平版印刷机，凹版印刷机，孔版印刷机；
- 按照纸张的尺寸规格分为：平版纸或单张纸印刷机，卷筒纸印刷机；
- 按照印刷色数分为：单色印刷机，双色印刷机，多色印刷机；
- 按照印刷幅面分为“八开印刷机，四开印刷机，对开印刷机，全张印刷机，超全张印刷机等；



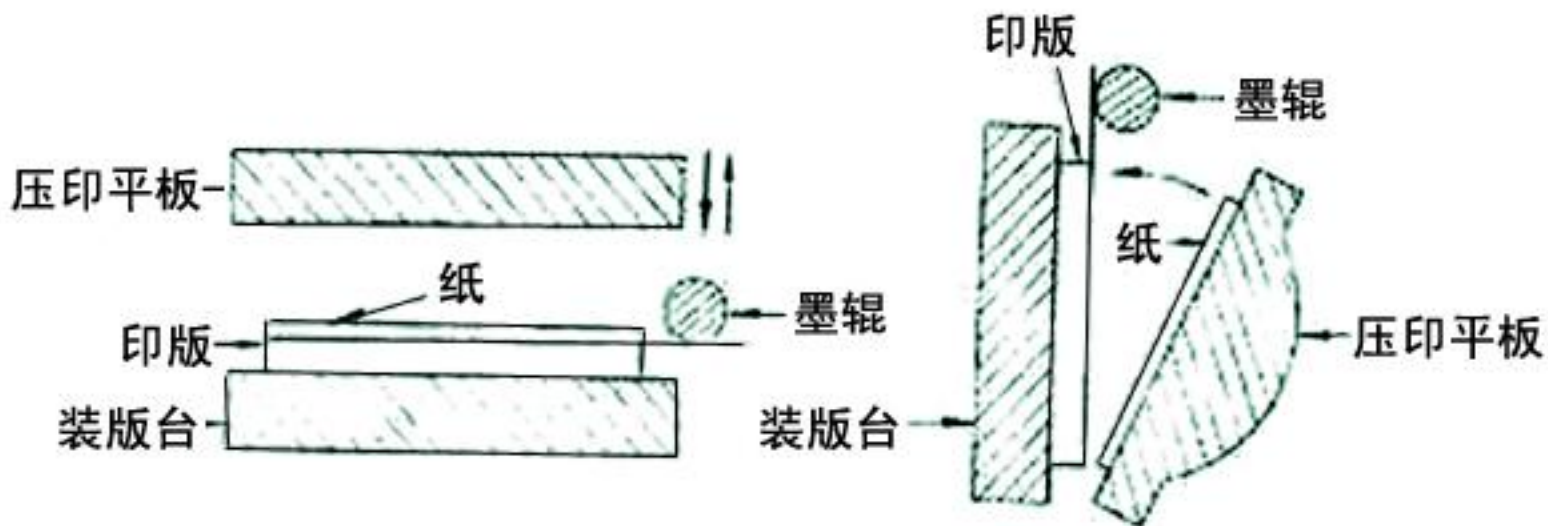
# 印刷机器的分类

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- 按照施加压力的方式，一般所印刷机分为以下三种：
  - ❖ 平压平型
  - ❖ 圆压平型
  - ❖ 圆压圆型



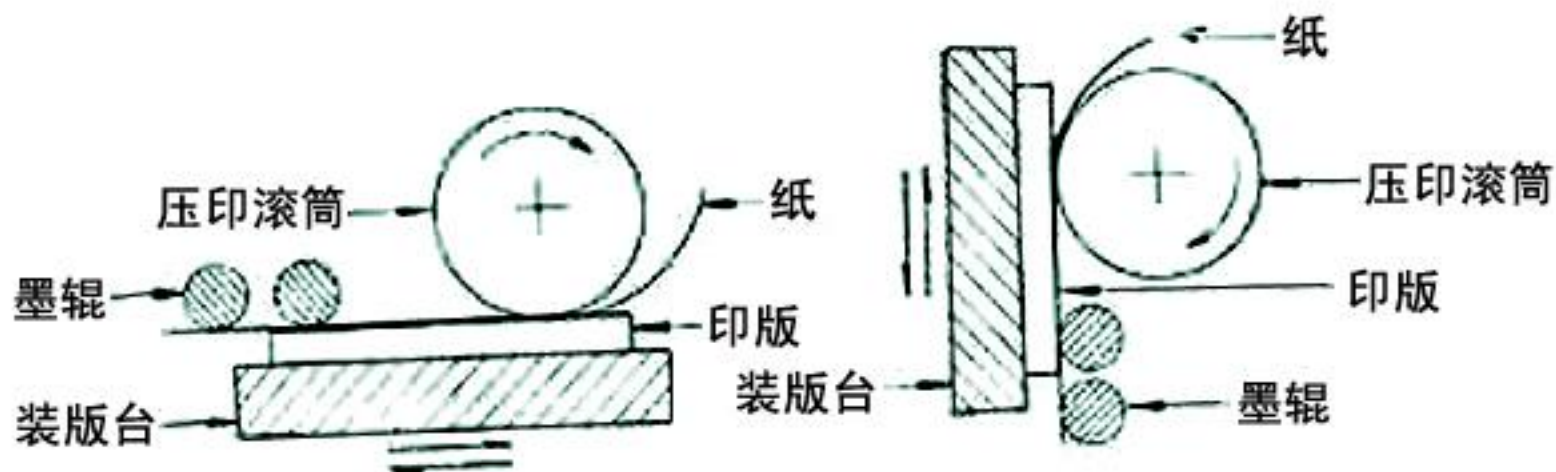
# 平压平型印刷机



○平压平型印刷机的结构特点是，装版机构和压印机构均呈平面形。印刷时，压印平版绕主轴进行往复摆动，完成输纸和压印。印刷品的墨色浓重，线条、笔划饱满。



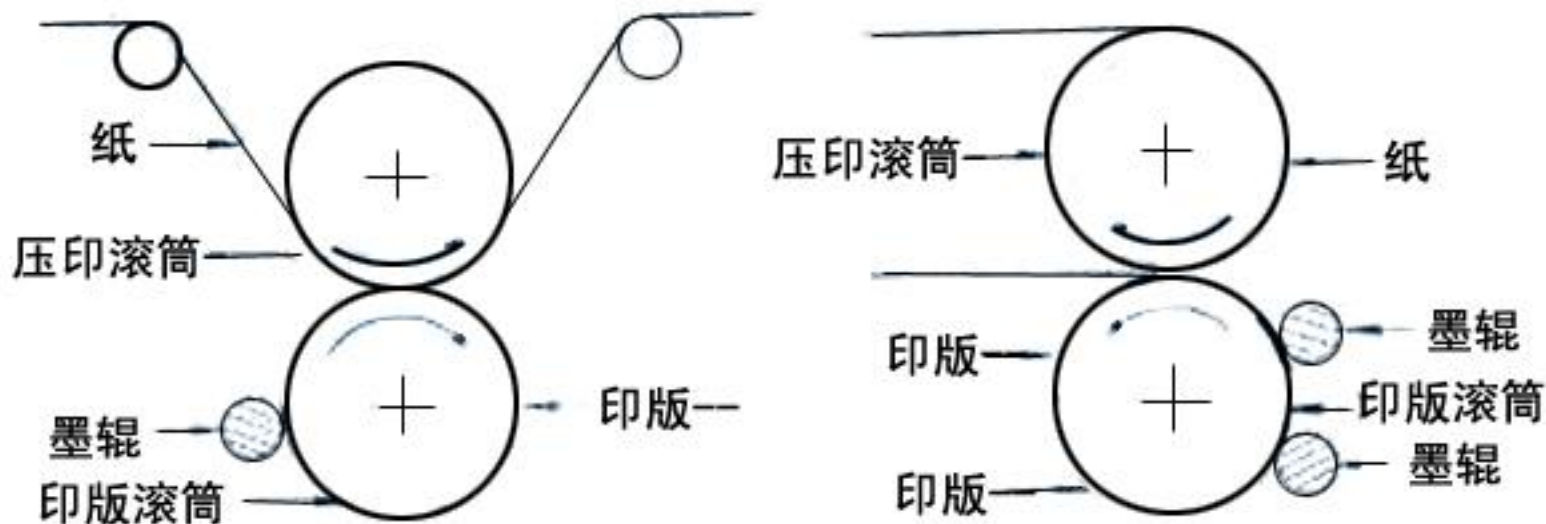
# 圆压平型印刷机



○装版机构呈平面形，压印机构是圆形的滚筒。印刷时，印版随同装版平台，相对于压印滚筒作往复的移动，压印滚筒一般在固定的位置上，带着承印物边旋转边压印，主要用于印刷书刊的正文。



# 圆压圆型印刷机



- 它的结构特点是，装版机构和压印机构均为圆柱形的滚筒。印刷时，压印滚筒带着承印物，相对于印版滚筒以相反的方向边转动边压印。

# 印刷的分类

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- 平版印刷
- 凸版印刷
- 凹版印刷
- 孔版印刷



# 平版印刷

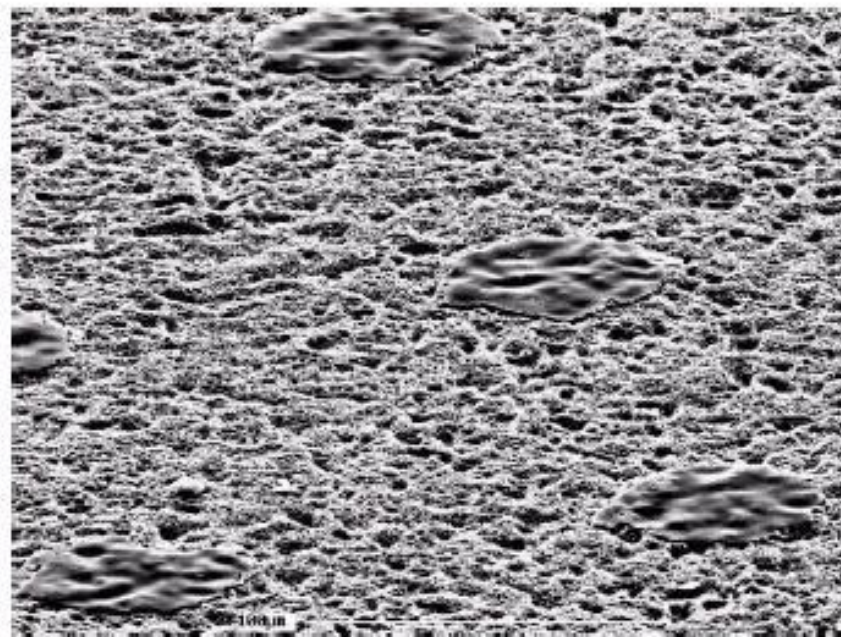
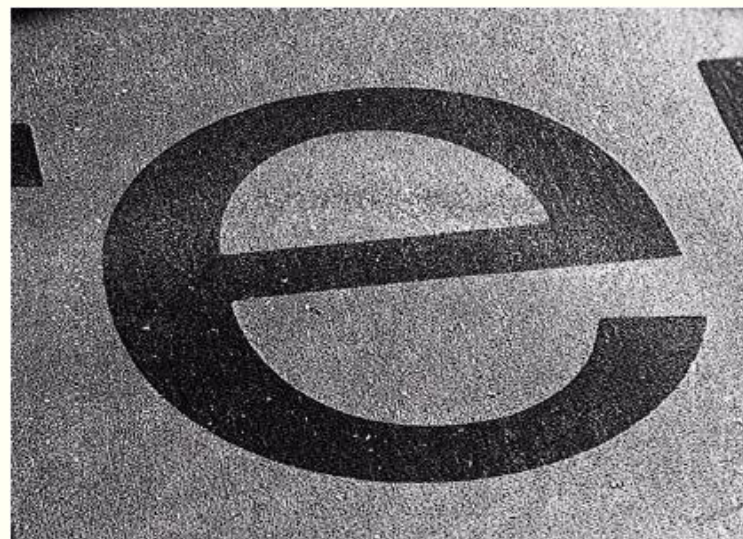
## Offset Printing...



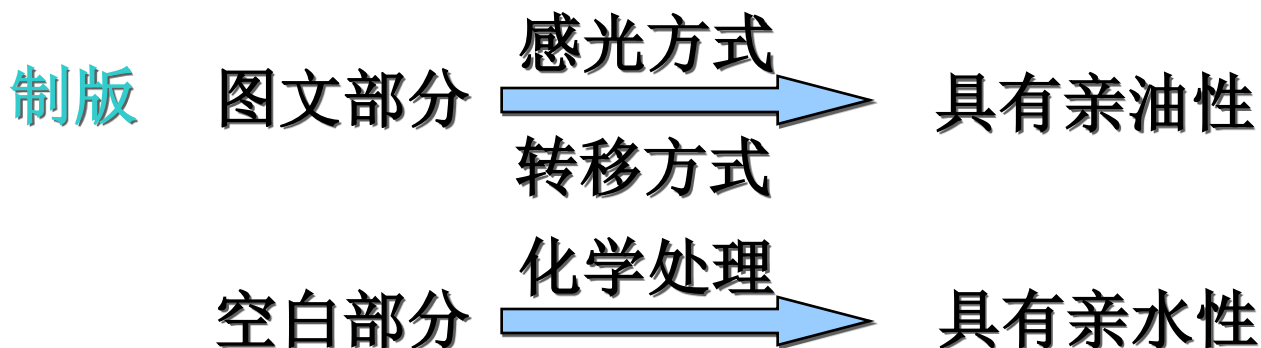
# 平版印刷

- 印版特征:

印刷部分与图文部分几乎在同一平面，无明显的高低之分（实际上有）



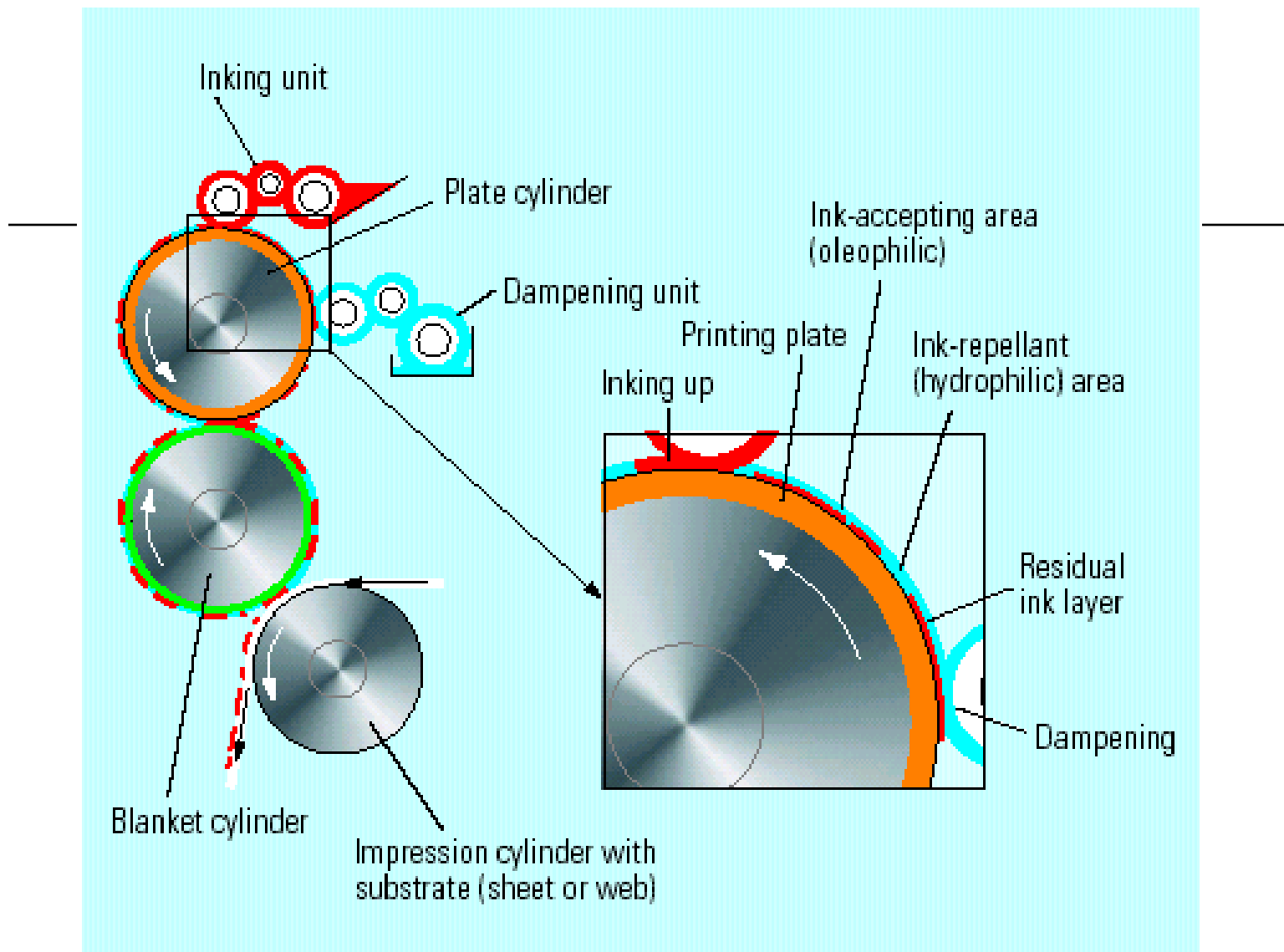
## • 印刷方法:



## 印刷 油水相斥的原理

- 先着水 → 空白吸附水分，图文不吸
- 再着墨 → 空白斥油，图文吸墨
- 后压印 → 图文部分油墨转移到承印物形成印迹





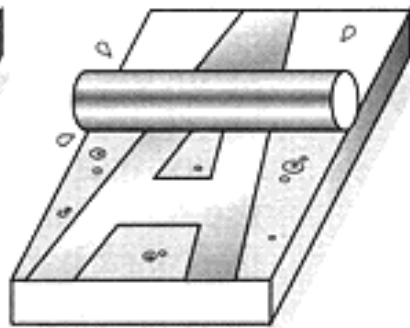
平版印刷上墨方法示意图



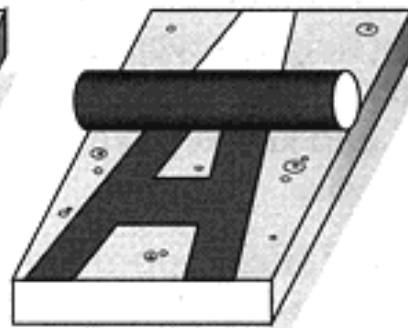
# 平版印刷的流程



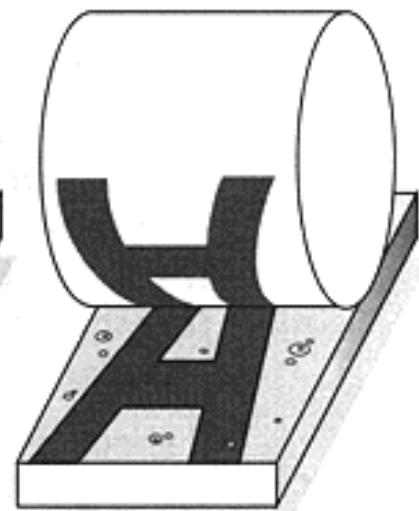
印刷部分通过感光方式或转移方式使之具有亲油性，空白部分通过化学处理使之具有亲水性



利用油水相斥的原理，在版面上湿水，使空白部分吸附水分



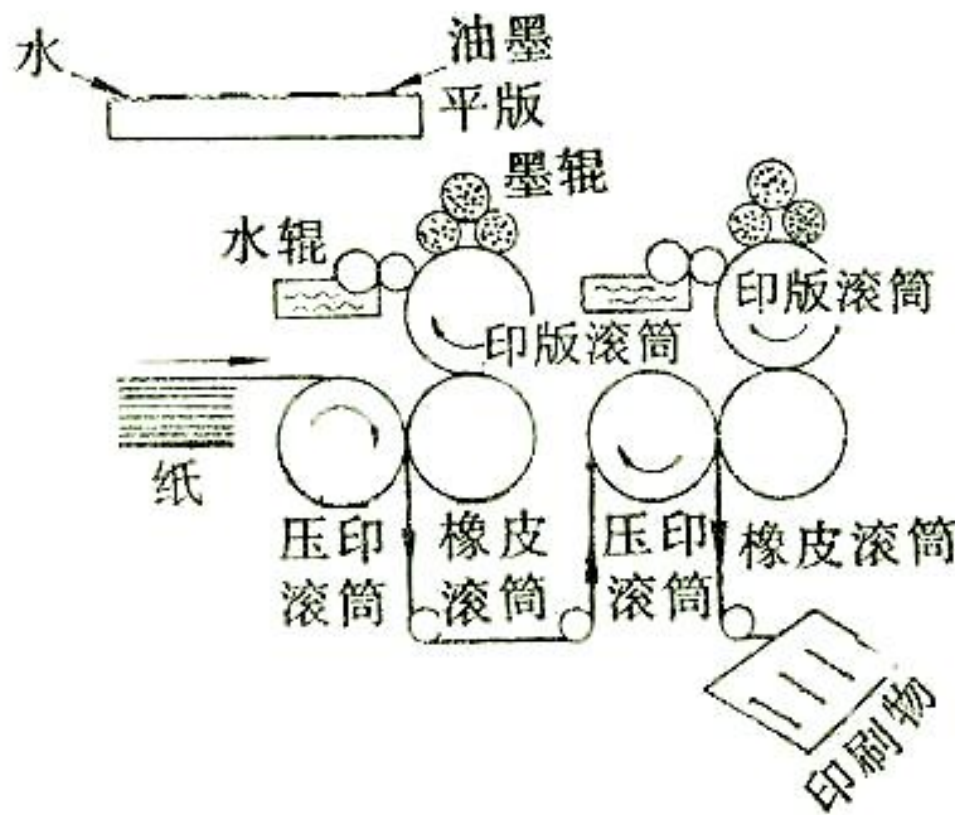
再往版面滚上油墨，使印刷部分附着油墨



使承印物与印版直接或间接接触，加以适当压力，油墨移到承印物上成为印刷品



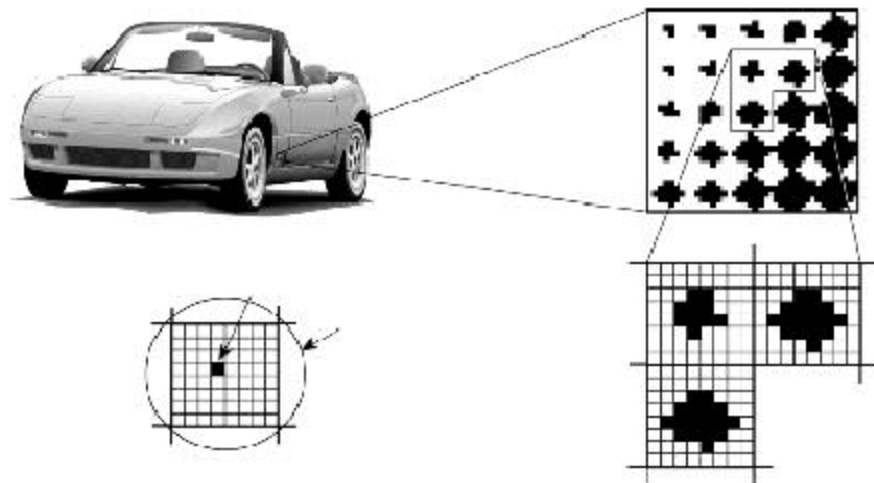
# 平版印刷的原理



- 水辊向印版供给润湿液，使空白的部分吸附水分
- 墨辊向印版供给油墨，使图文部分粘附油墨
- 施加压力，图文部分的油墨经橡皮滚筒转移到承印物表面。

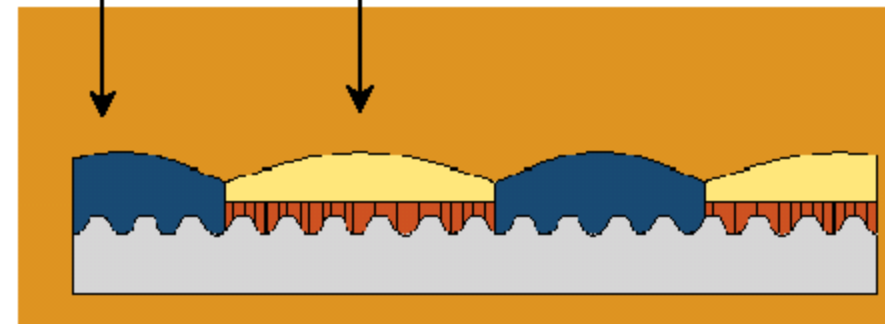
# Screening and Printing Plate

Printing and non-printing areas are at the same level



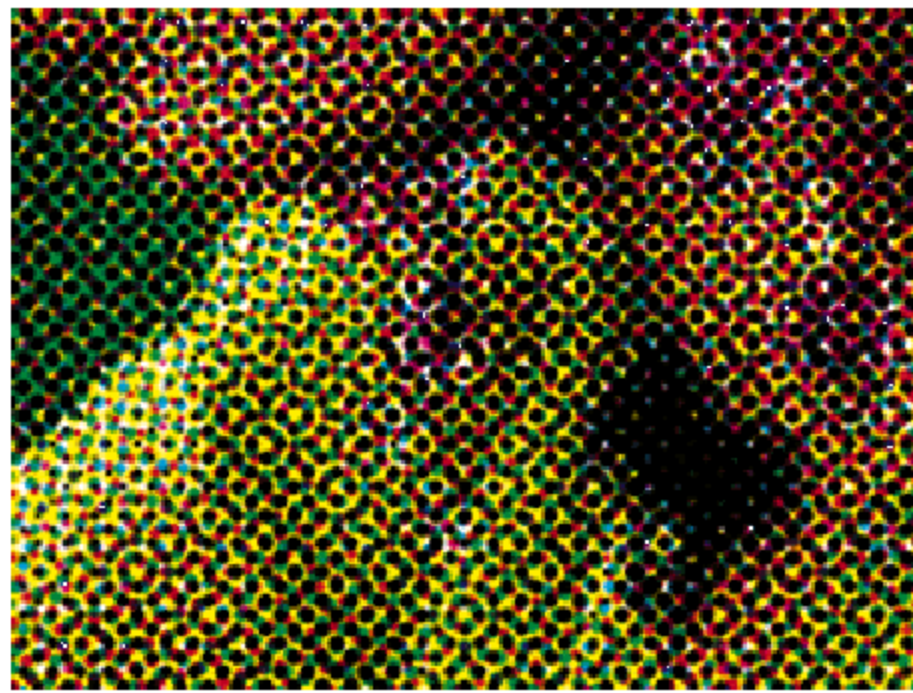
Non-printing area  
(hydrophillic)

Printing areas



## Sheetfed Offset - Characteristic Features

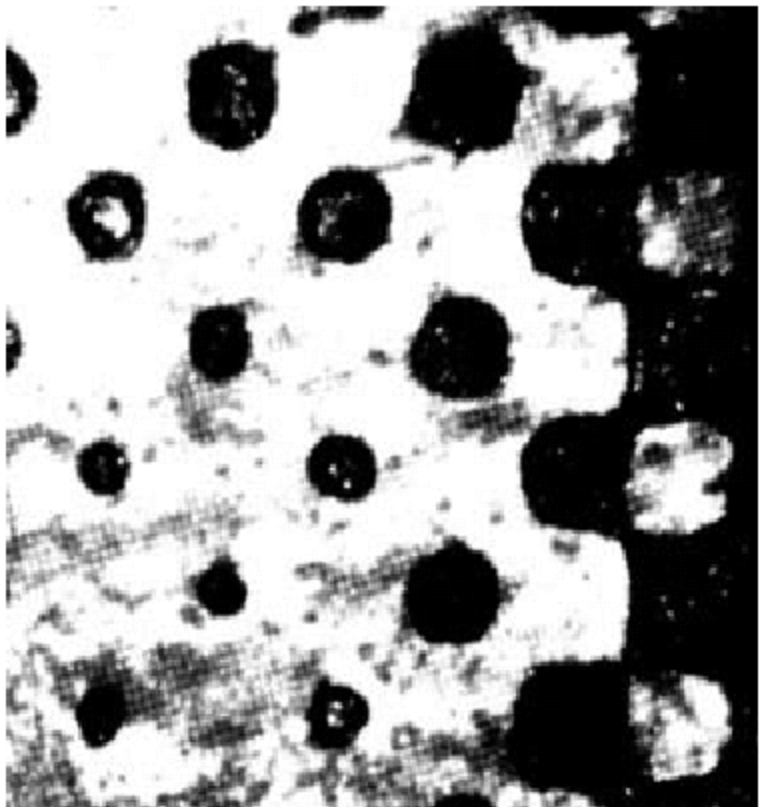
- No pressure marks of the printing forme
- Images and letters have an almost sharp edge definition, but they are uniformly covered
- Printing substrates with rather uneven surface can be printed with solids and fine screen



# Typical Print Result - Offset Printing

Image and text are uniformly covered

The image shows the lowercase letters 'n' and 'a' in a bold, serif font. The letters are solid black with a slightly grainy texture, indicating they were printed using offset printing. The 'n' has a vertical stem and a rounded top, while the 'a' has a rounded bowl and a tail.



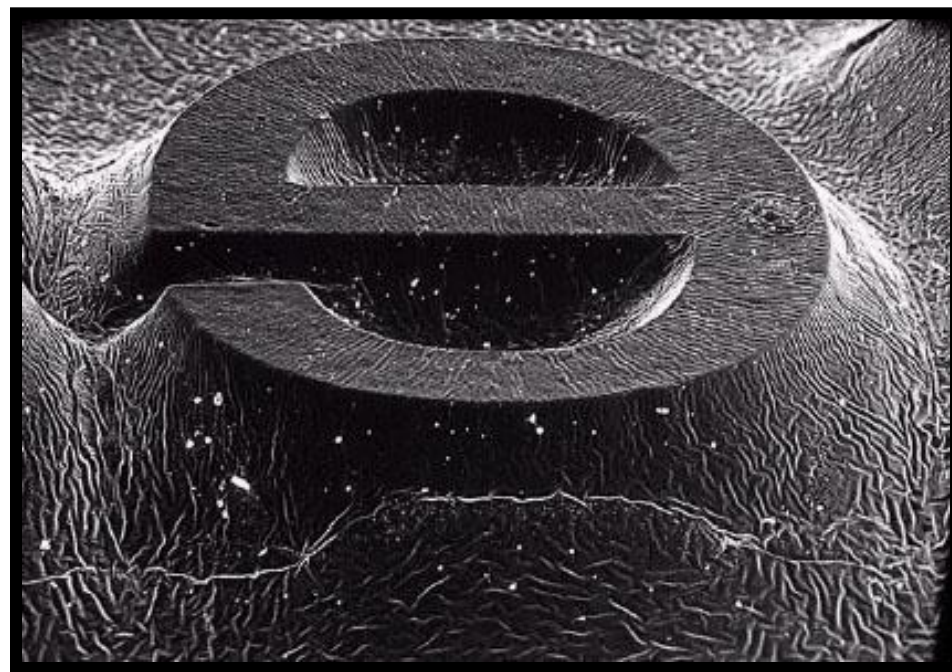


○凸版印刷

Letterpress Printing...

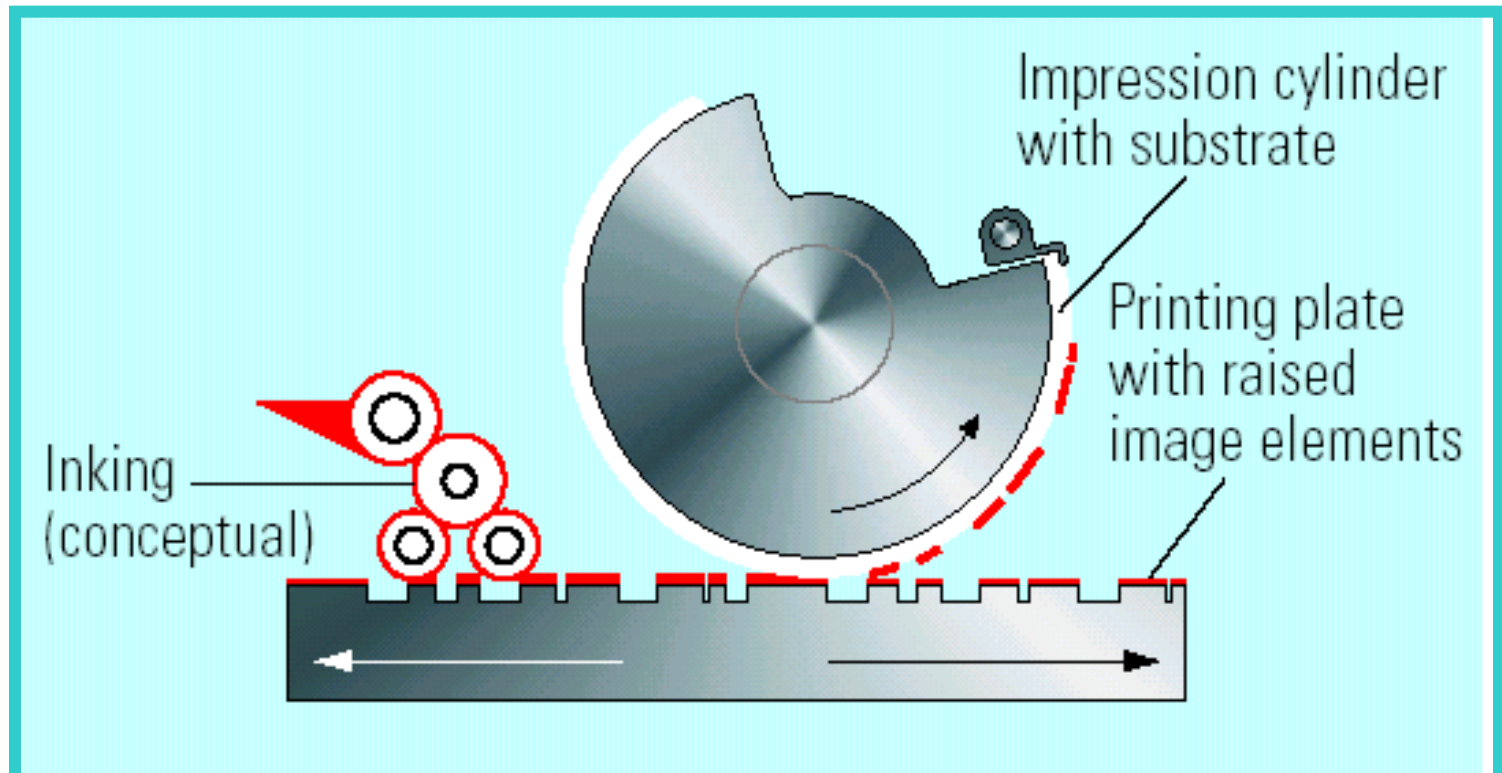
# 凸版印刷

- 印版特征：  
印刷部分高于空白部分，印刷部分在同一平面。



## • 印刷方法:

**墨辊给印刷部分敷墨，压印使版与承印物接触，油墨转移**



- 印品特征:

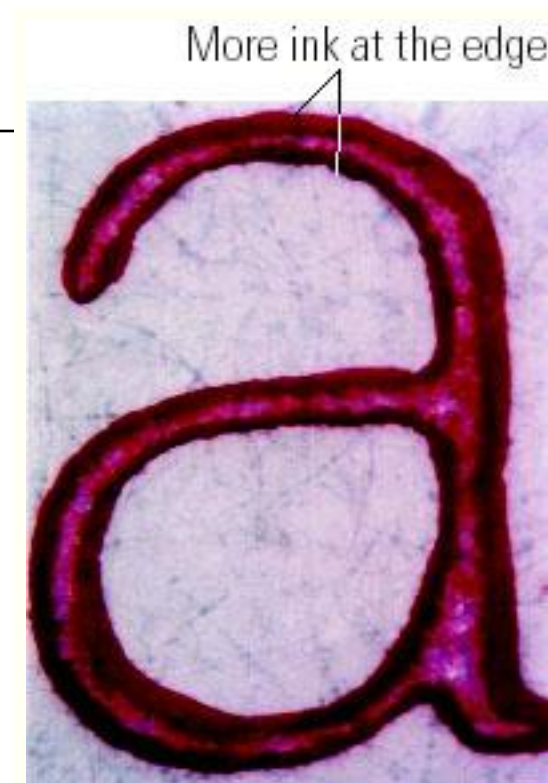
有不明显的平整度

- 印版种类:

铅合金版，铜版，锌版，  
感光树脂凸版，塑料版

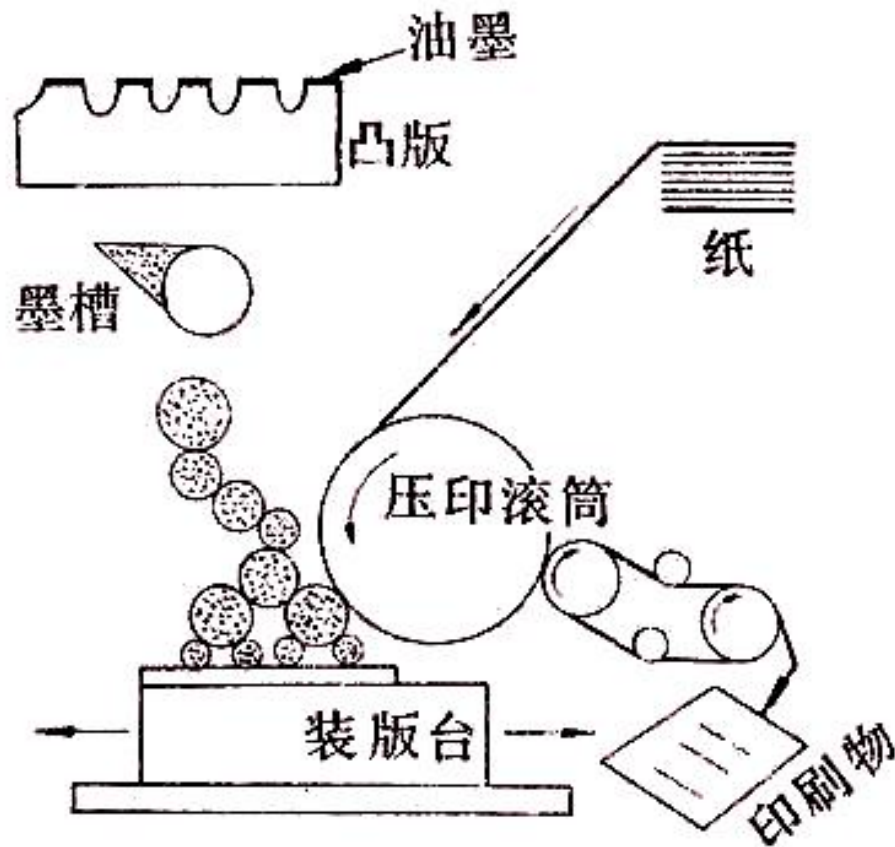
- 适用:

包装装潢材料，商业表格印刷，  
书报杂志，杂件



# 凸版印刷的原理

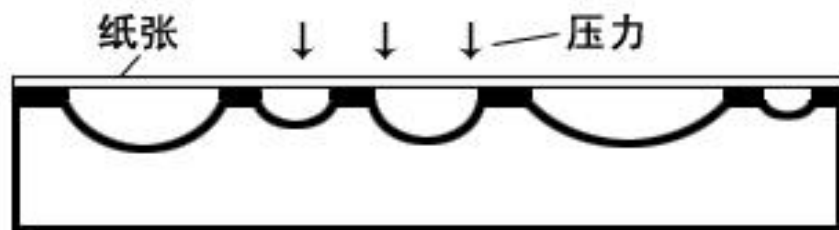
- 墨辊滚过印版表面，使油墨粘附在凸起的图文部分
- 承印物和印版上的油墨相接触
- 在压力的作用下，图文部分的油墨转移到承印物表面。



# 凸版印刷的流程



① 在图文部分敷以油墨



② 使纸张等承印物与印版接触，并加以一定压力。

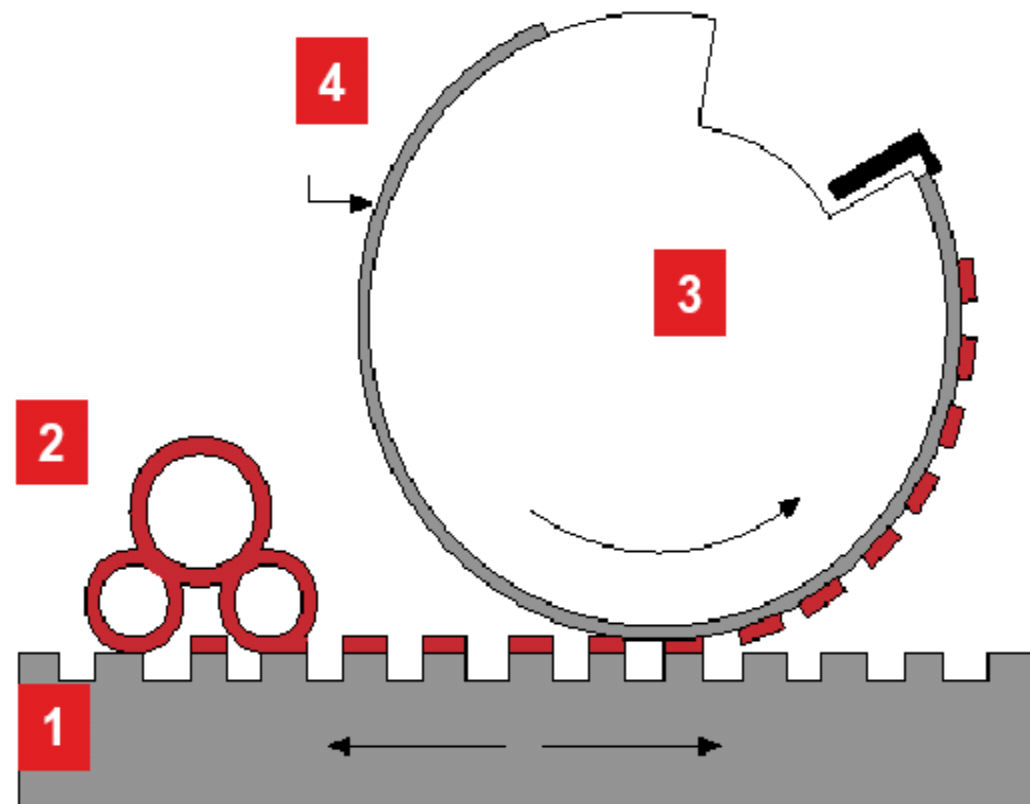


③ 印版上图文部分的油墨转印到纸张上得到印刷成品。



# Letterpress Printing - Direct printing process

The printing areas are raised -  
printing areas are inked



Typical products

- Shopping bags
- Personal items

Special uses

- Creasing
- Perforating
- Numbering
- Die cutting

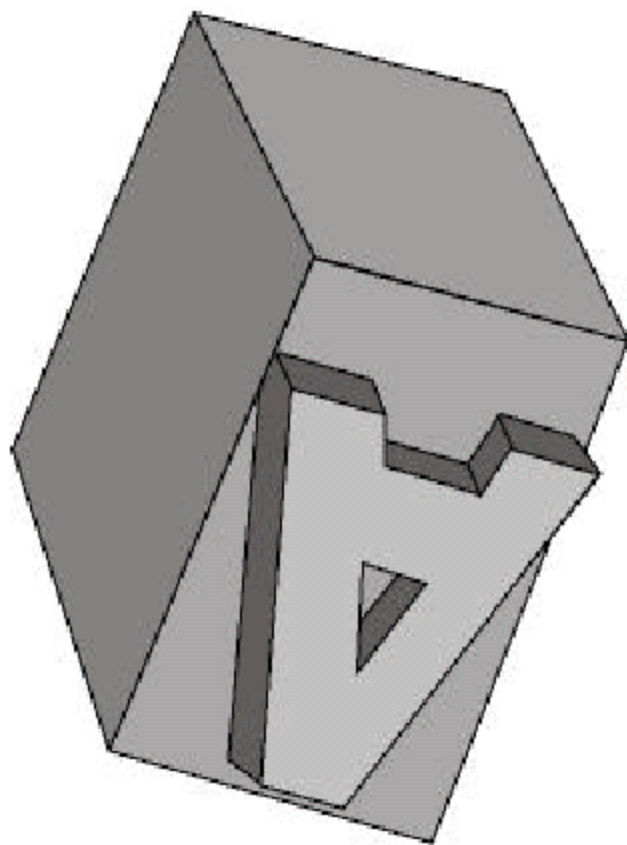
**1** Printing forme

**2** Inking rollers

**3** Impression cylinder

**4** Paper

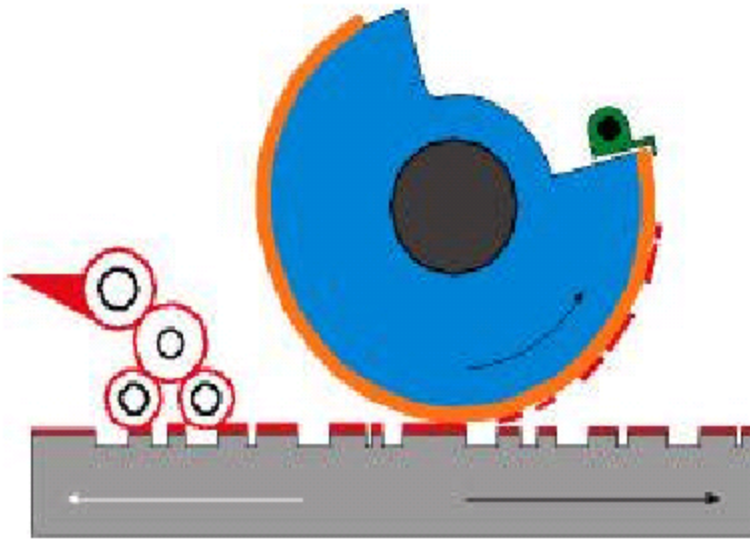
# The Printing Forme



Printing letter

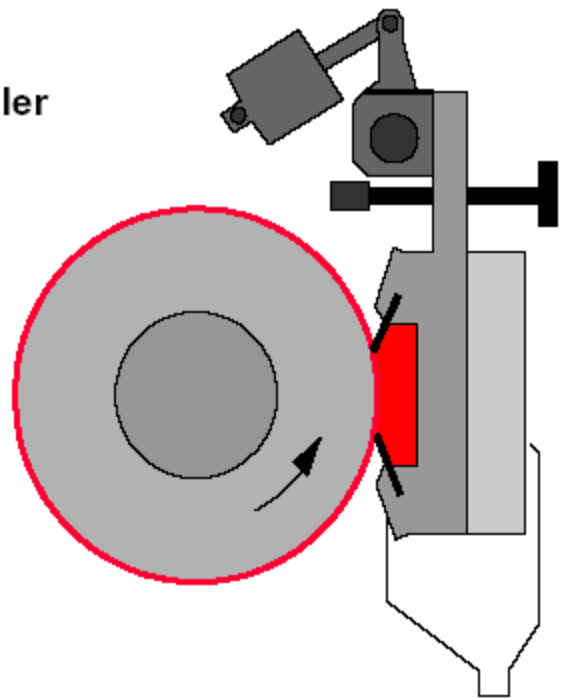


# The Printing Unit



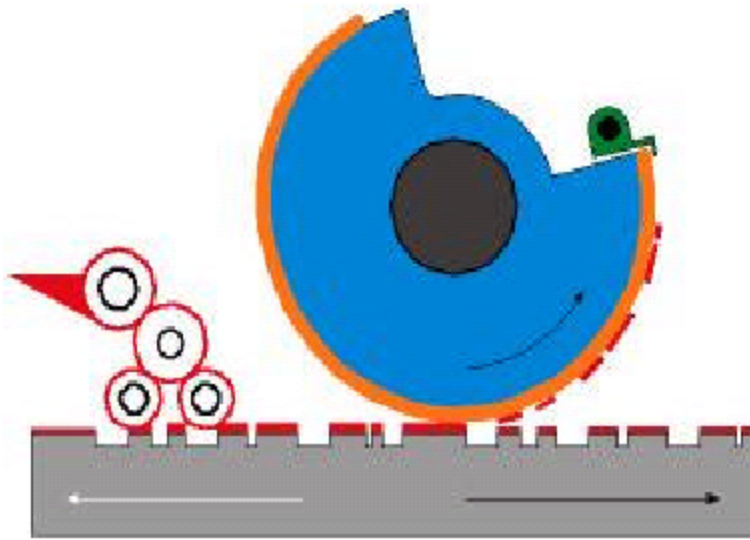
Printing unit of a cylinder press

Anilox-Roller



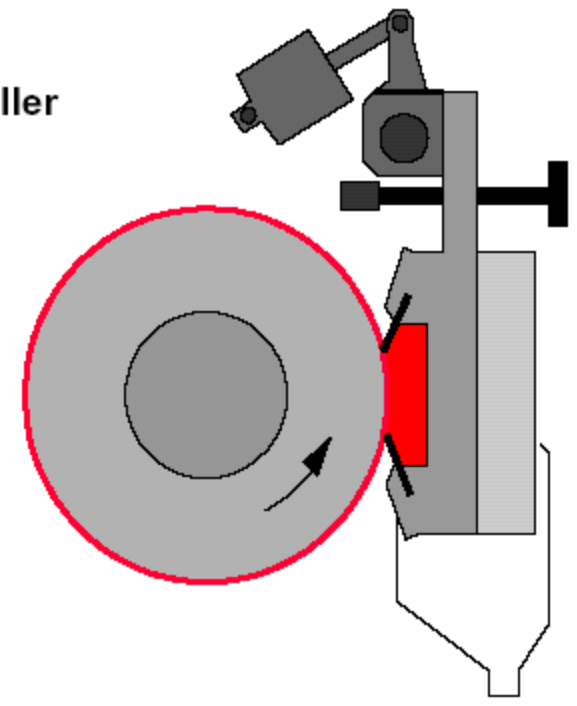
Chamber doctor blade system of a Flexo press

# The Printing Unit



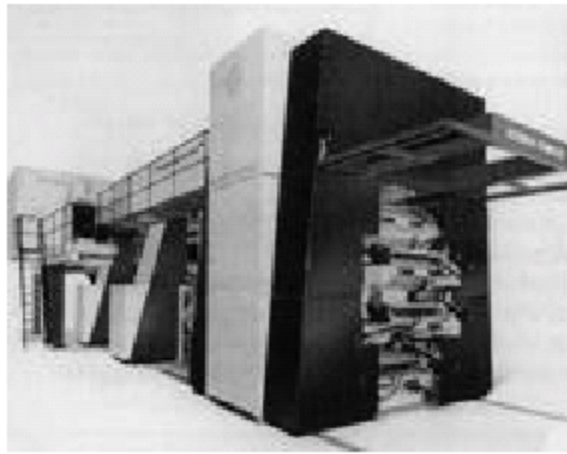
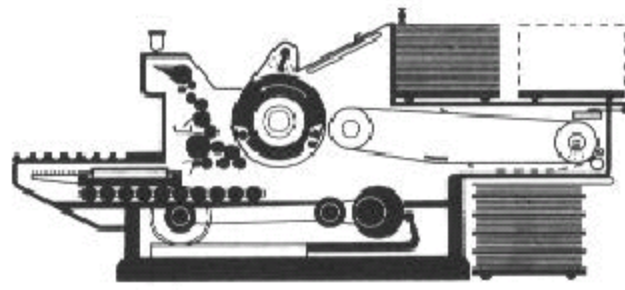
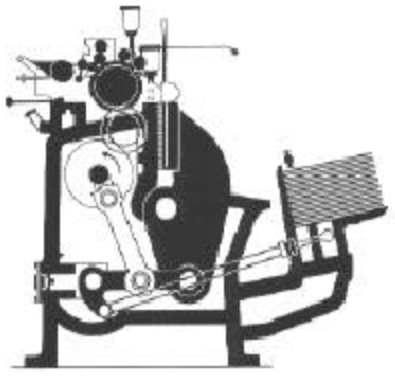
Printing unit of a cylinder press

Anilox-Roller

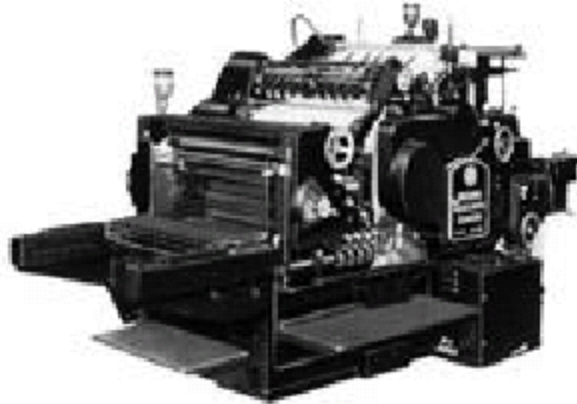


Chamber doctor blade system of a Flexo press

# The Presses



Original Heidelberg Platen

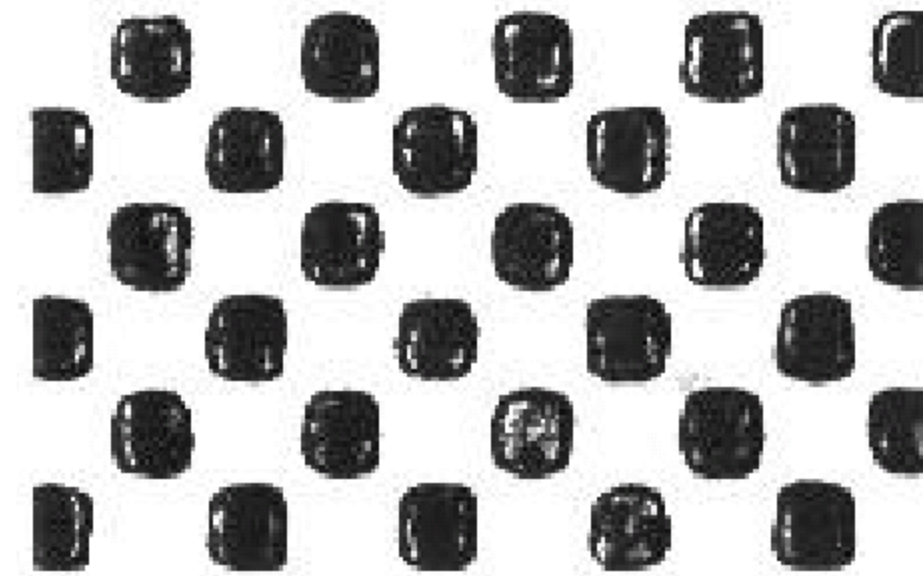


Original Heidelberg Cylinder

Multicolor Flexopress

# Typical Print Result – Letterpress/Flexo

Letters and screen dots are characterized by the typical dot fringe





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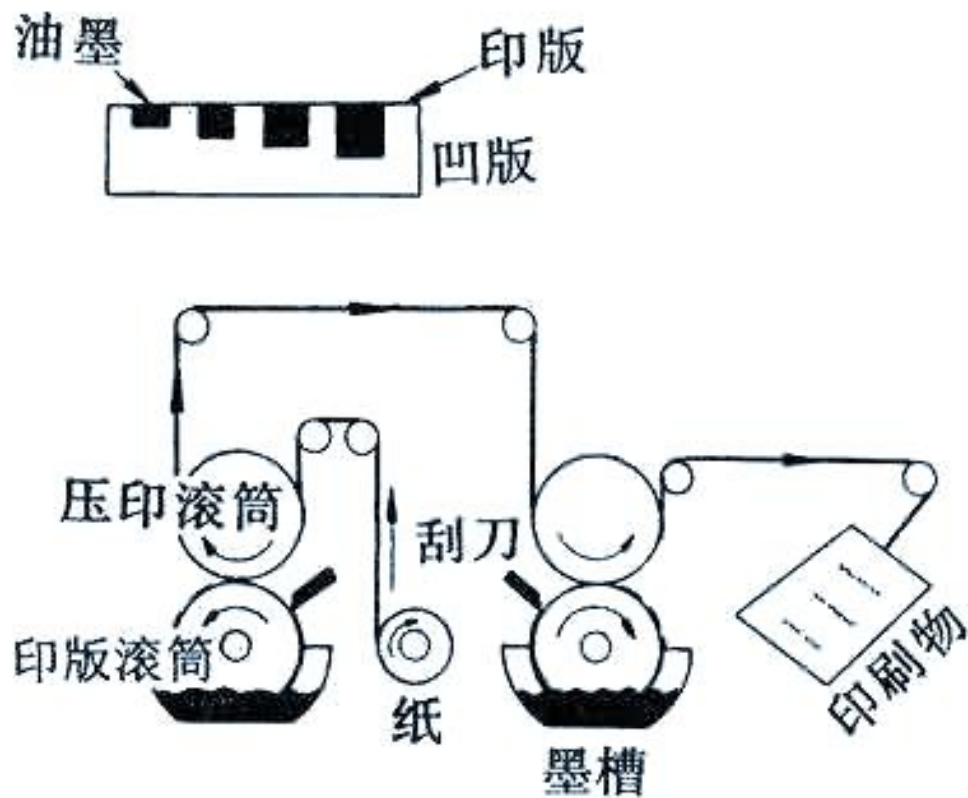
凹版印刷

○Gravure Printing

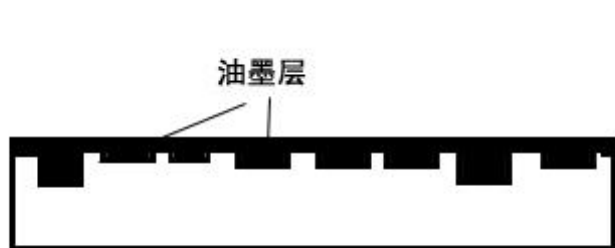


# 凹版印刷的原理

- 整个印版表面涂满油墨。
- 然后刮墨刀，把空白部分去除。
- 油墨留在图文部分的”孔穴“之中
- 压力作用下，将油墨转移到承印物表面。



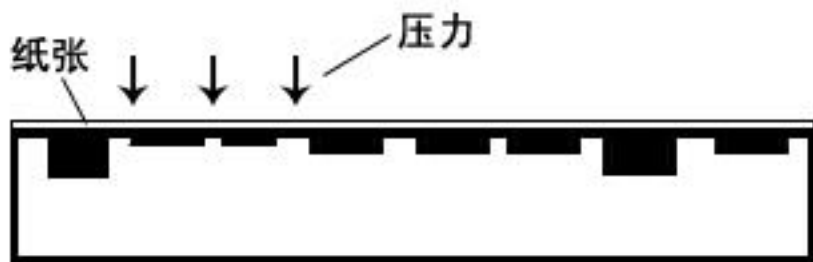
# 凹版印刷的流程



① 全版面涂布油墨。



② 用刮墨机械刮去平面上（即空白部分）的油墨，使油墨只保留在版面低凹的图文部分上。



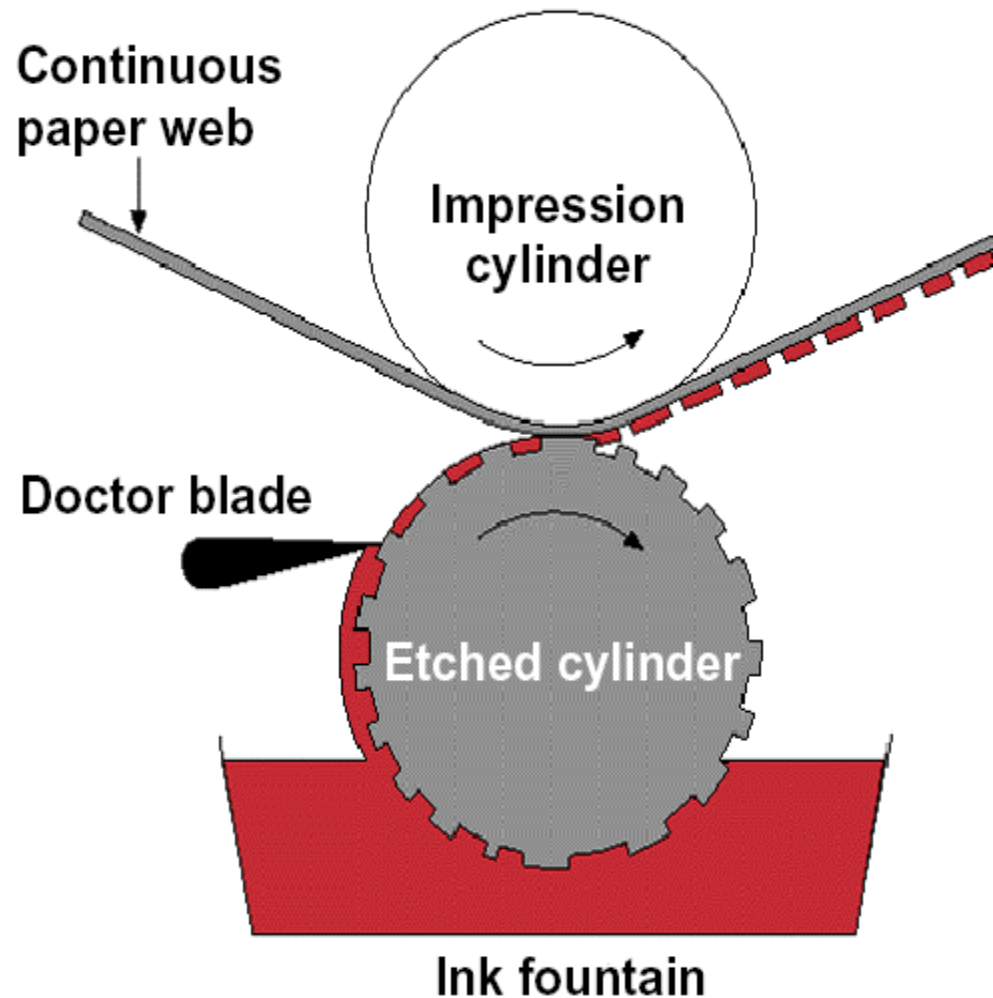
③ 在版面上放置吸墨力强的承印物，施以较大压力。



④ 版面上图文部分的油墨转移到承印物上，获得印刷品。

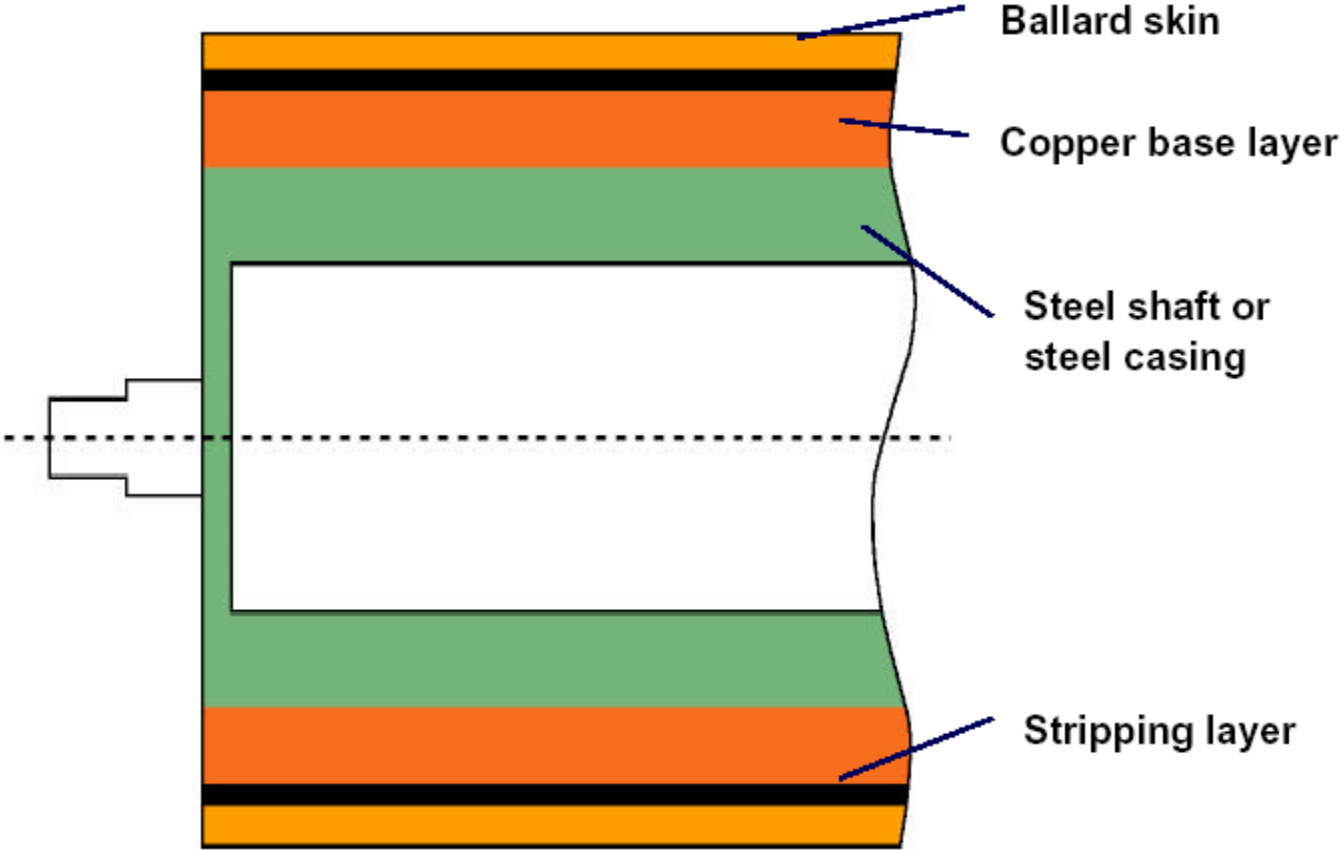
## Principles of Gravure Printing - Direct printing process

- Printing areas are recessed
- Printing and non-printing areas are inked
- A doctor blade removes ink from non-printing areas
- Typical products
  - Packaging
  - Mass mailings
  - Mail order catalogs
  - Large-format magazines
- Run length > 100,000 sheets





# The Printing Forme



# The Cylinder Preparation - The Gravure



Front view



Flat depth of engraving:  
Lights

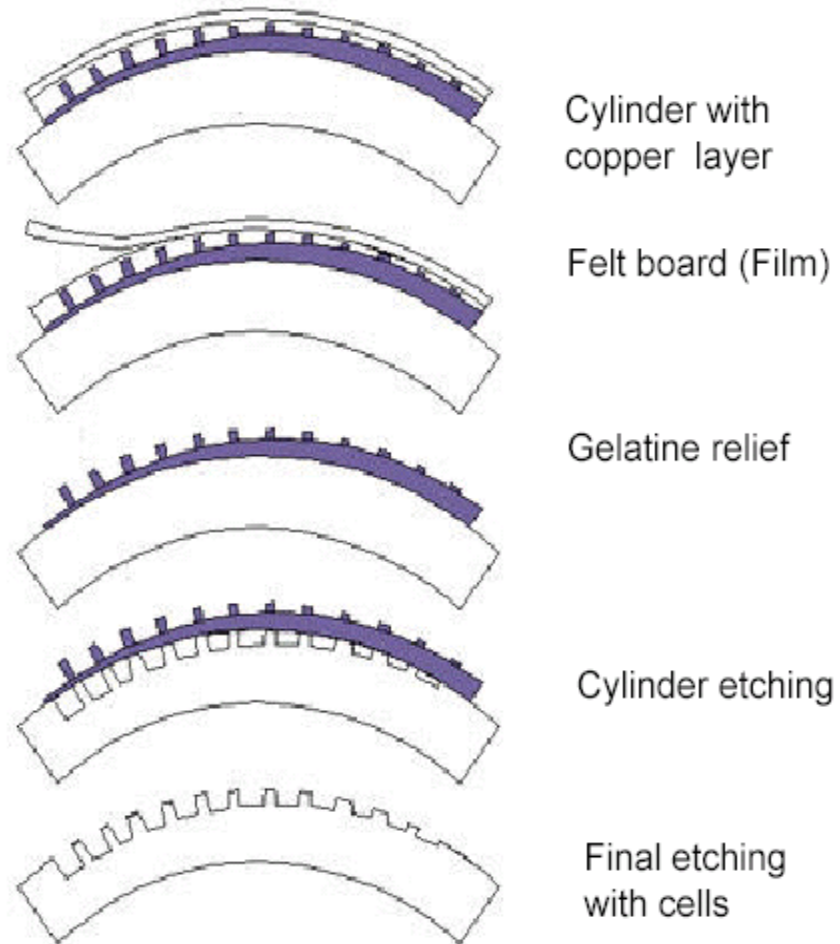


Scooper form



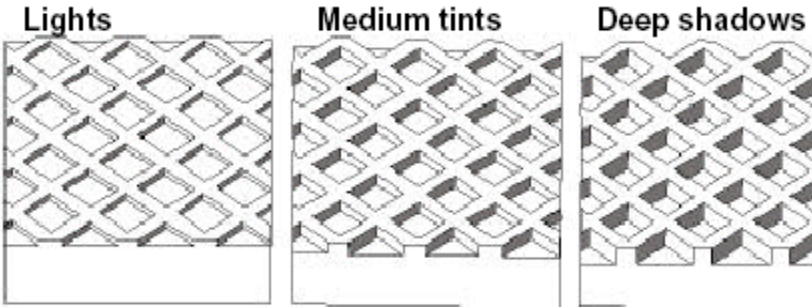
Deep engraving:  
Deep shadows

# The Cylinder Preparation – The Etching of Images

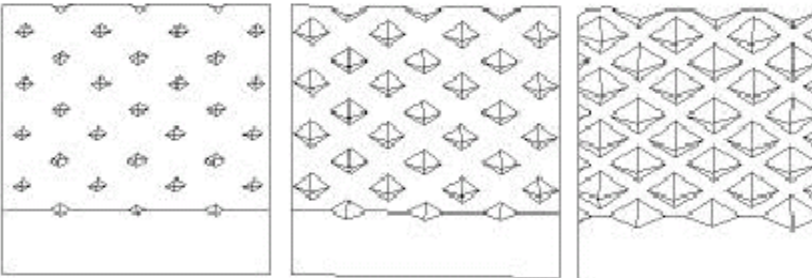


# The Printing Forme

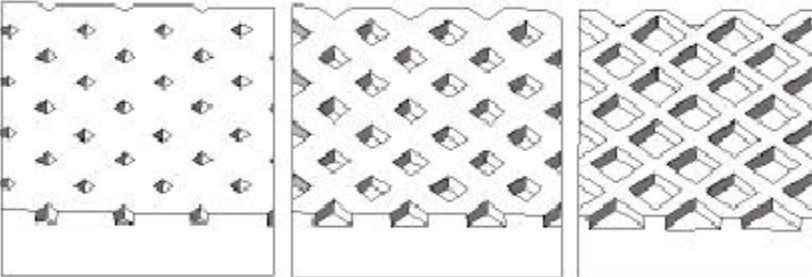
Variable recesses or conventional gravure printing.  
The cell depth varies acc. to tonal value



Variable recesses and surfaces (semi-autotypical)

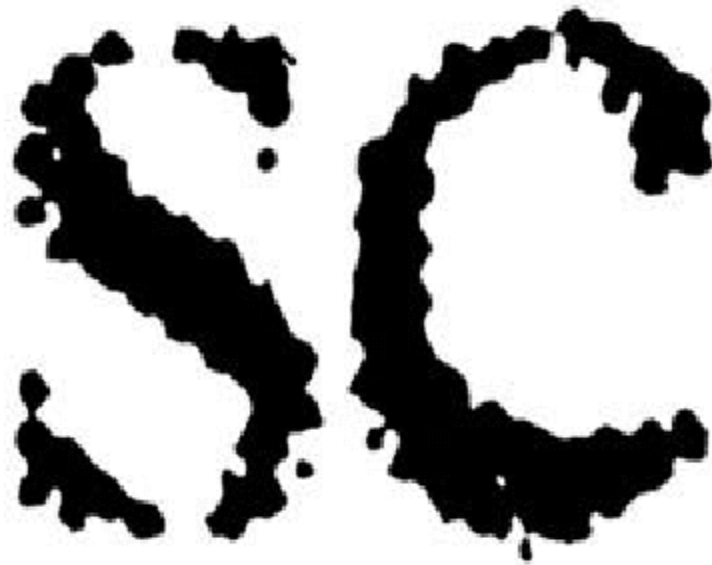


Variable surfaces (autotypical)  
The cell depth is constant for all tonal values, only the cell surface varies acc. to tonal value



## Typical Print Result – Gravure Printing

Types showing sawtooth effect  
(serrated edges)

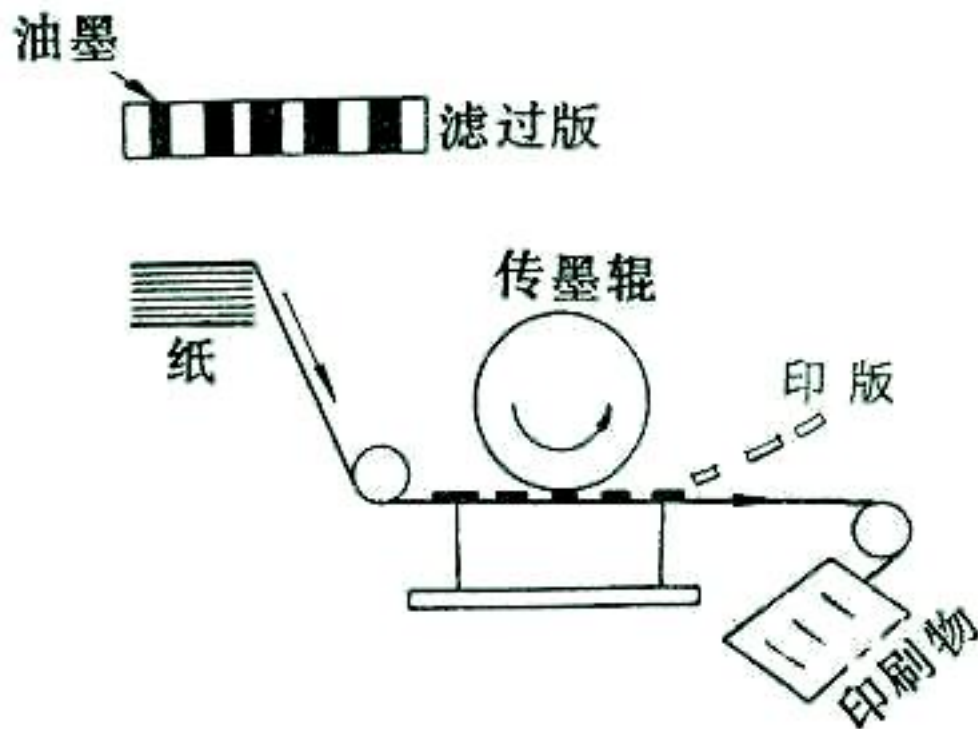


○丝网印刷

Screen Printing...

# 孔版印刷

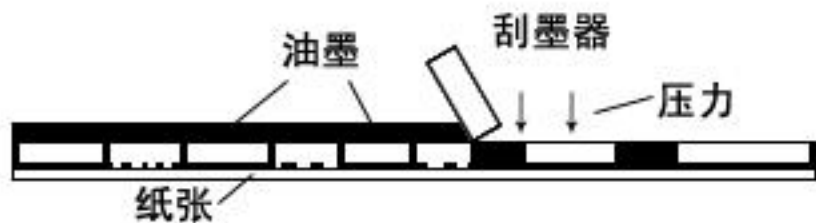
- 印刷时，先把油墨堆积在印刷的一侧。
- 用刮板或压辊，边移动边刮压或滚压。
- 油墨透过印版的孔洞或网眼，漏印到承印物表面。



# 孔版印刷的流程



① 在印版上敷以油墨。



② 将承印物放在印版下，用刮墨器以一定的压力刮墨使油墨透过孔洞。



③ 转移到承印物上形成印刷品

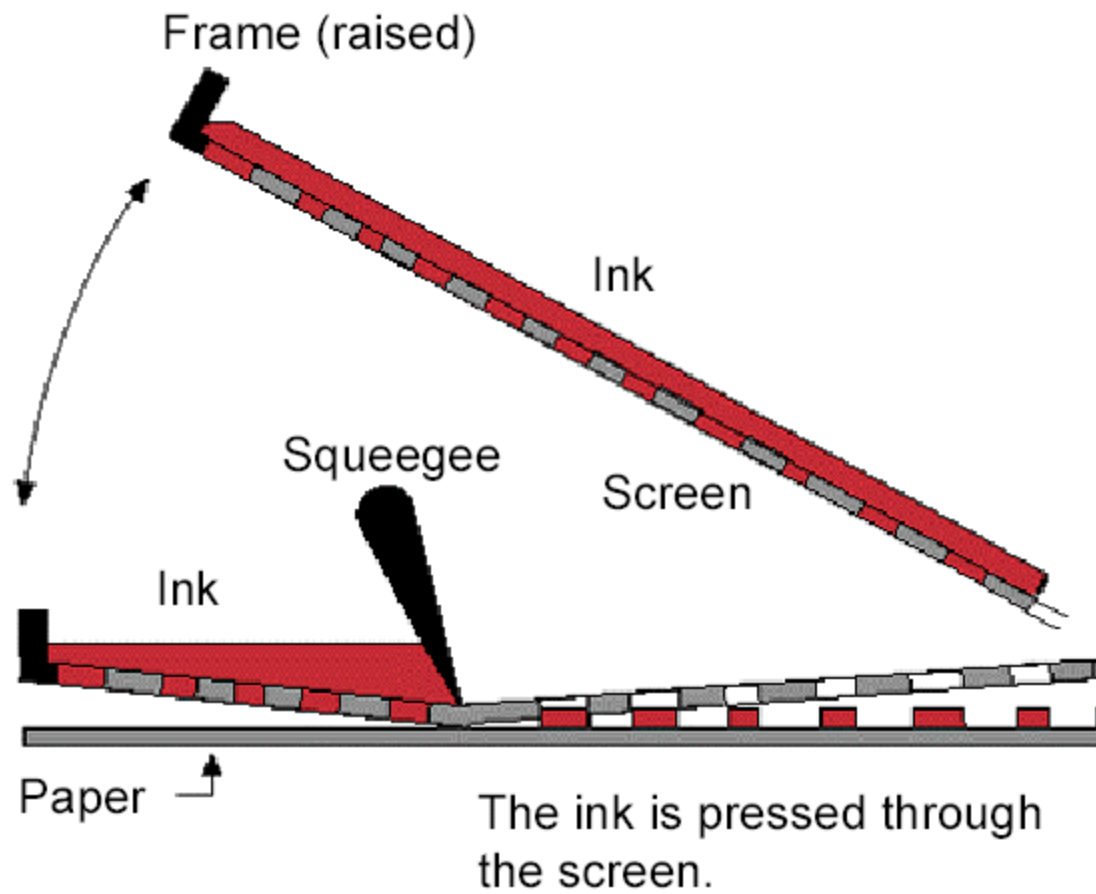




# Screen Printing

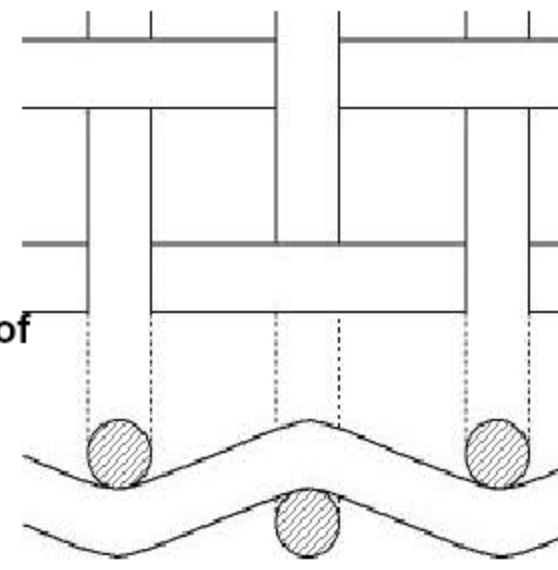
- Typical products:
  - Three-dimensional substrates (bottles, tubes, fabrics, displays, stickers)
  - Short runs
- Ink application is 10 -20 times heavier than with other methods
- Special effects such as fluorescent inks

*The printing areas allow the ink to pass through the screen*



# Screen Preparation

Theads can be made out of synthetic fibre or metal



**In-the-fabric stencil (exposure and development)**

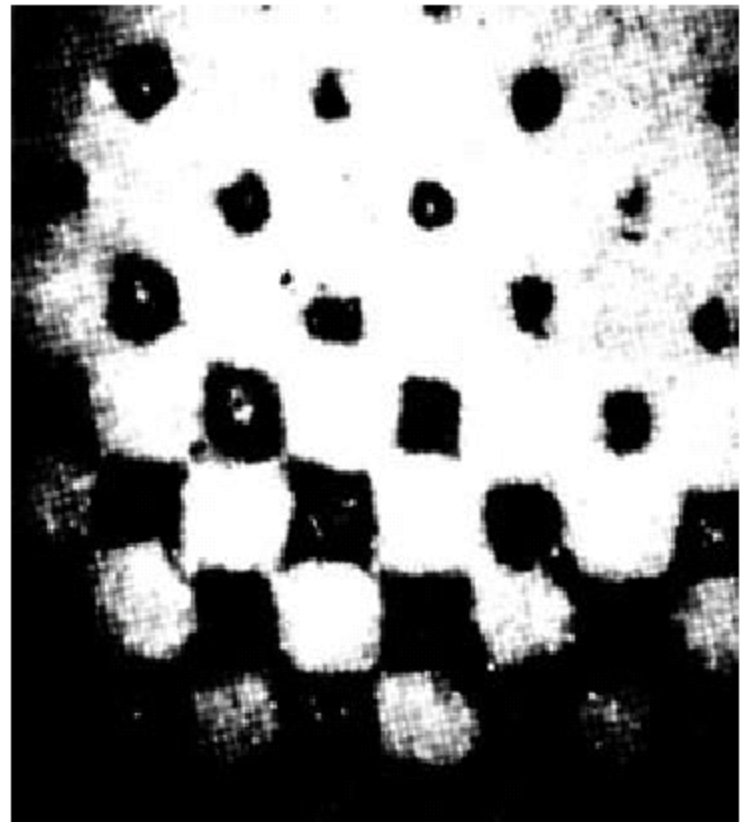
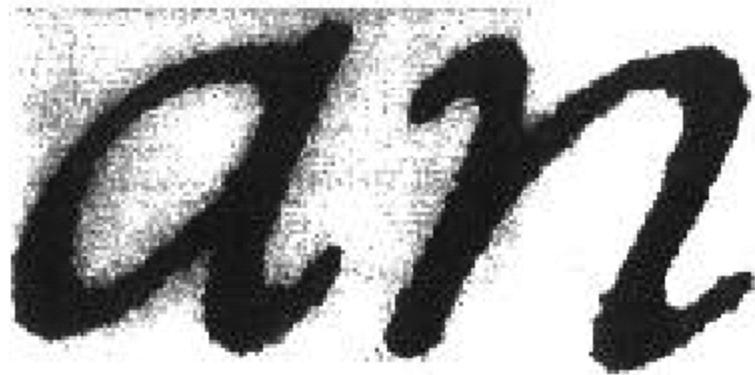
A diagram showing a sequence of seven circular patterns. The first and last patterns are blue, representing the stencil after exposure and development. The middle five patterns are white circles, representing the stencil before development. The blue patterns have a central hole, and the white circles are arranged in a row between them.

**At-the-fabric stencil (cut stencil)**

A diagram showing a sequence of seven circular patterns. The first and last patterns are blue, representing the stencil after cutting. The middle five patterns are white circles, representing the stencil before cutting. The blue patterns have a central hole, and the white circles are arranged in a row between them.

# Typical Print Result - Screen Printing

The screen structure is visible



# 其他印刷方法

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我国特有的木版水印，以及软管印刷、喷墨印刷、全息照像印刷、静电印刷等等。



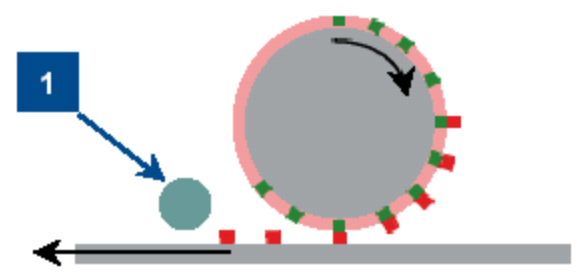
The image shows the top portion of a presentation slide. At the very top is a horizontal toolbar with various icons for navigation and editing, including arrows, a hand, a magnifying glass, and a text tool. A dropdown menu shows '150%' with a minus sign on the left and a plus sign on the right. To the right of the percentage are icons for a new page, a page, a page with a red border, a page with a blue border, and a page with a green border. The Adobe logo is on the far right of the toolbar.

# The Ink Jet Process ...

**... is used in all ink jet printers.**

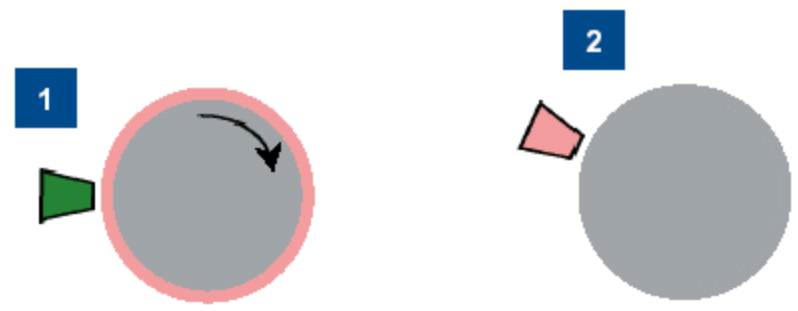
The bottom of the image shows a portion of a Windows taskbar. It includes a small icon on the left, followed by the text '11.60 x 8.26 in', and then several other icons including a square, a magnifying glass, and a yellow icon.

### 5. Fixing of the ink toner



- 1 Roller for fixing the toner to the sheet surface (There are thermal and liquid fixing methods)

### 6. Erasing



- 1 Erasing of the image charge
- 2 Erasing of the static charge

# Typical Print Result - Electrophotography

