

FlatJet Dispensing & Printing Technology

FlatJet

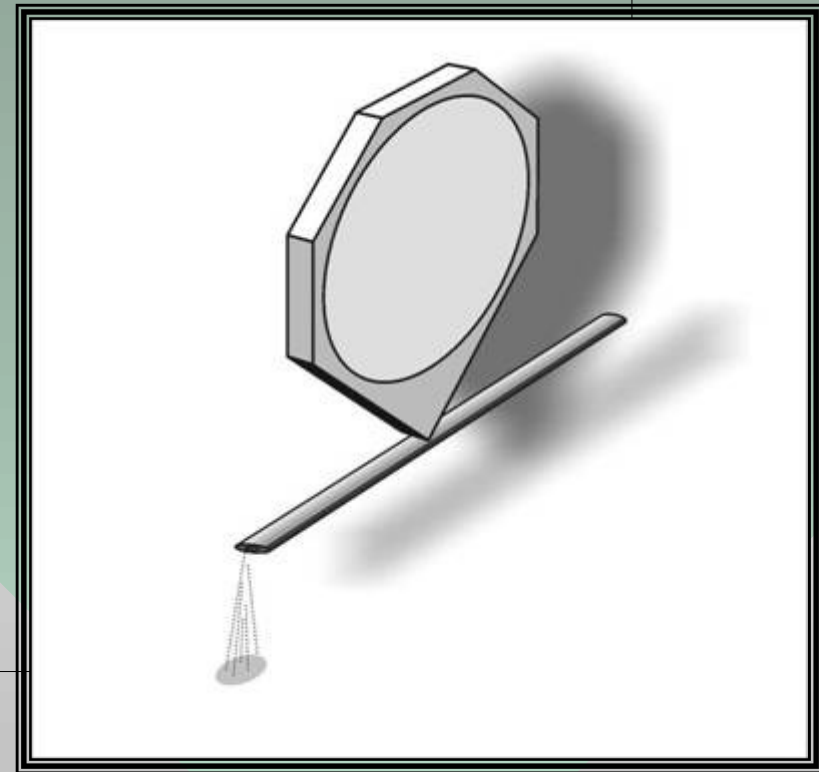


Digital Printing System

FlatJet

FlatJet

- Liquid dispensing
- High Throughput Printing



Objective

FlatJet

- The development of the technology is motivated by the **gap** between production rate of a conventional **offset** and the **digital** systems.
- Other ink-jet developers are searching solutions to **reduce** the ejected ink quantity – our aiming was opposite – the **high flow rate**.

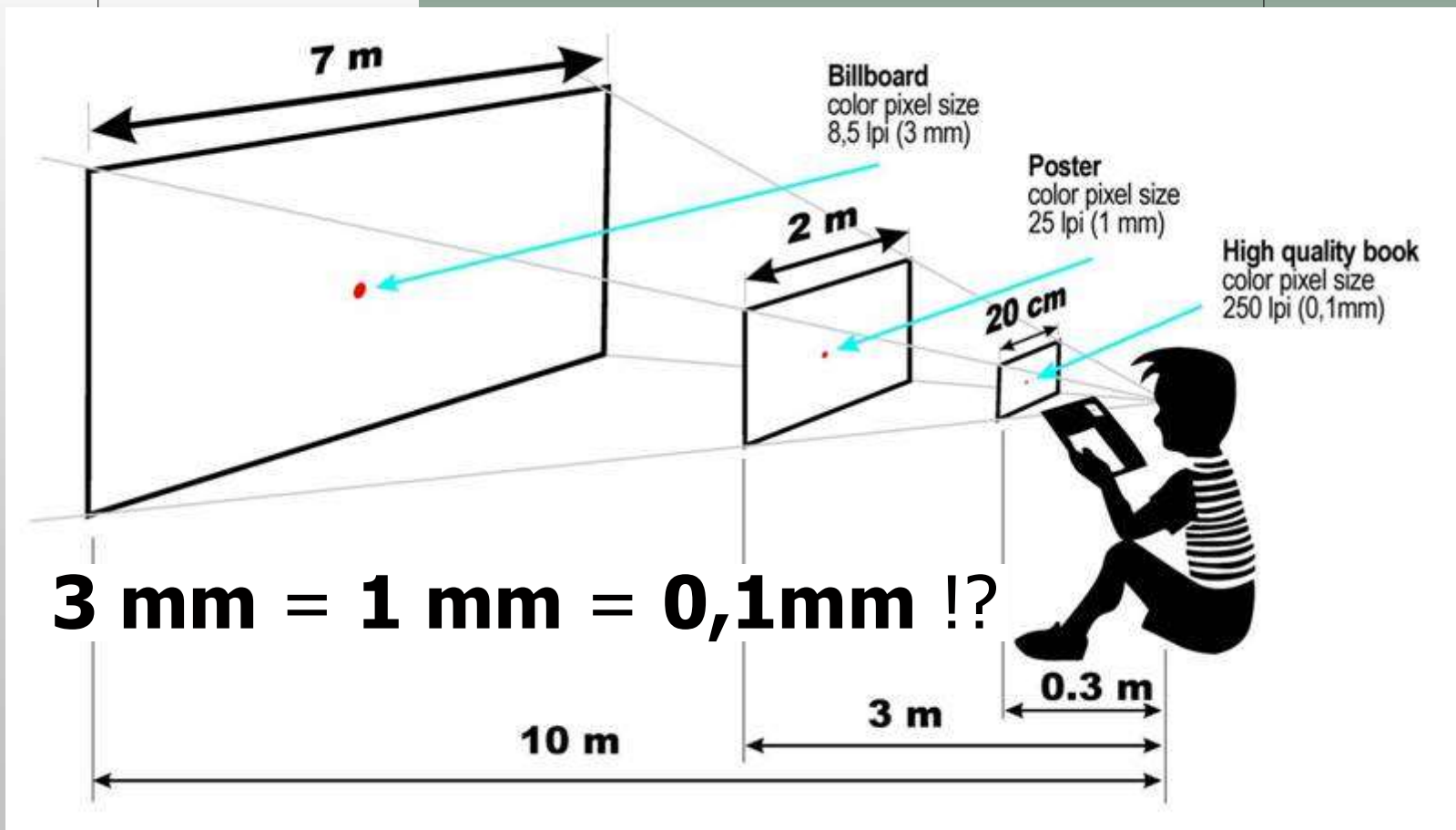
The aimed resolution

FlatJet

- The theoretical limit of the human eye's resolution is $1'$ angle – it means that from **3 meter** viewing distance, **1 mm** size details can hardly be distinguished.
- Our basic objective was to find solution to produce images for **large distance** observation with as high throughput as possible.

Human eye's resolution

FlatJet



The result

FlatJet

- simple **robust** construction, possibility of low production costs
- very low & extremely **high liquid flow**
- Possibility of **media-wide** operating large-format digital systems
- Individually replaceable printing elements

Simple and easy to manufacture

FlatJet

- FlatJet is assembled of a metal plate and tube, and a piezo-ceramic disc
- Simple and relatively robust mechanical construction
- Conventional materials and manufacturing

The head

FlatJet



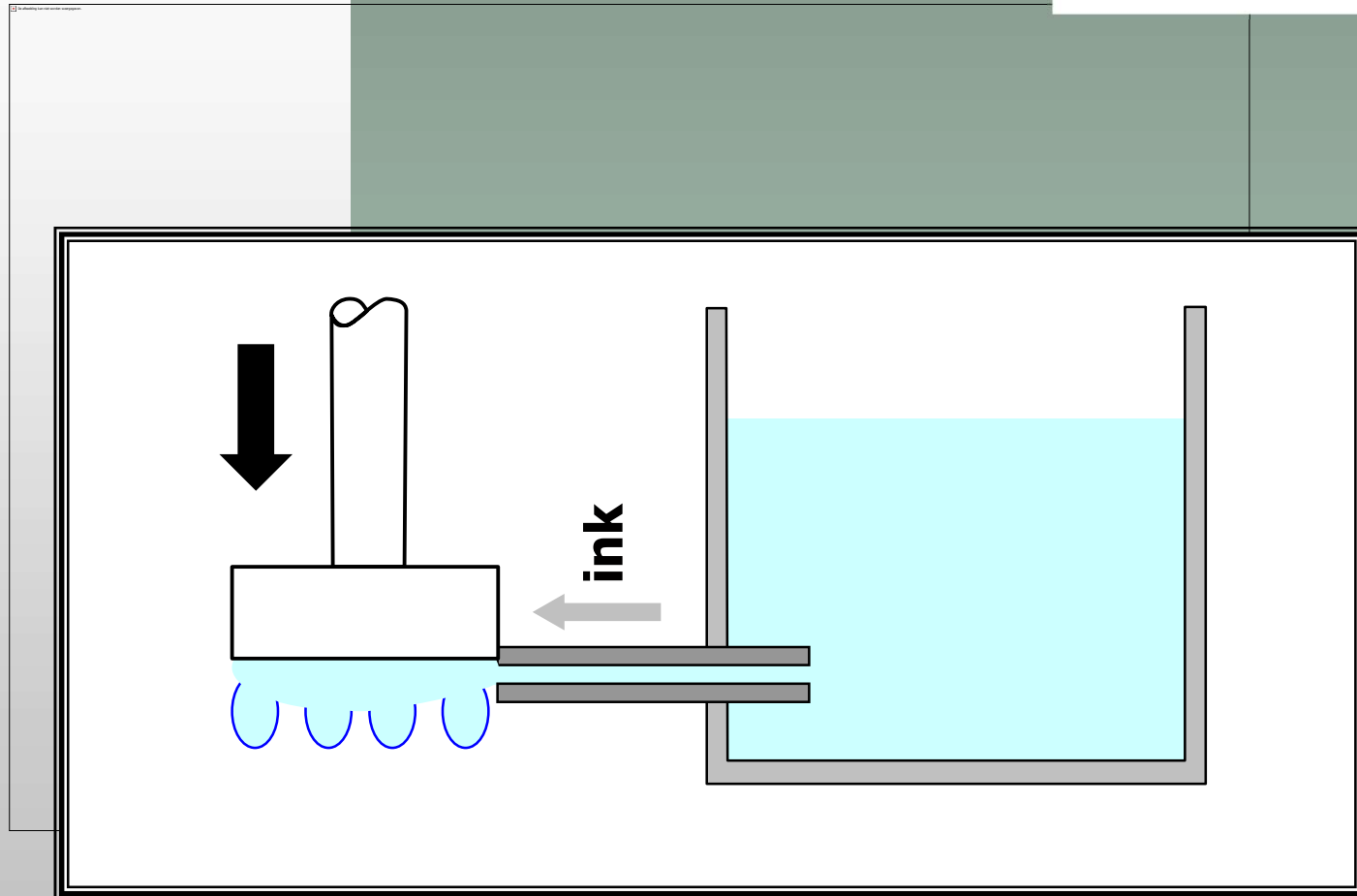
The liquid transfer

FlatJet

- From **pico-liter** range ejection **up to 50 microliters/s** continuous flow

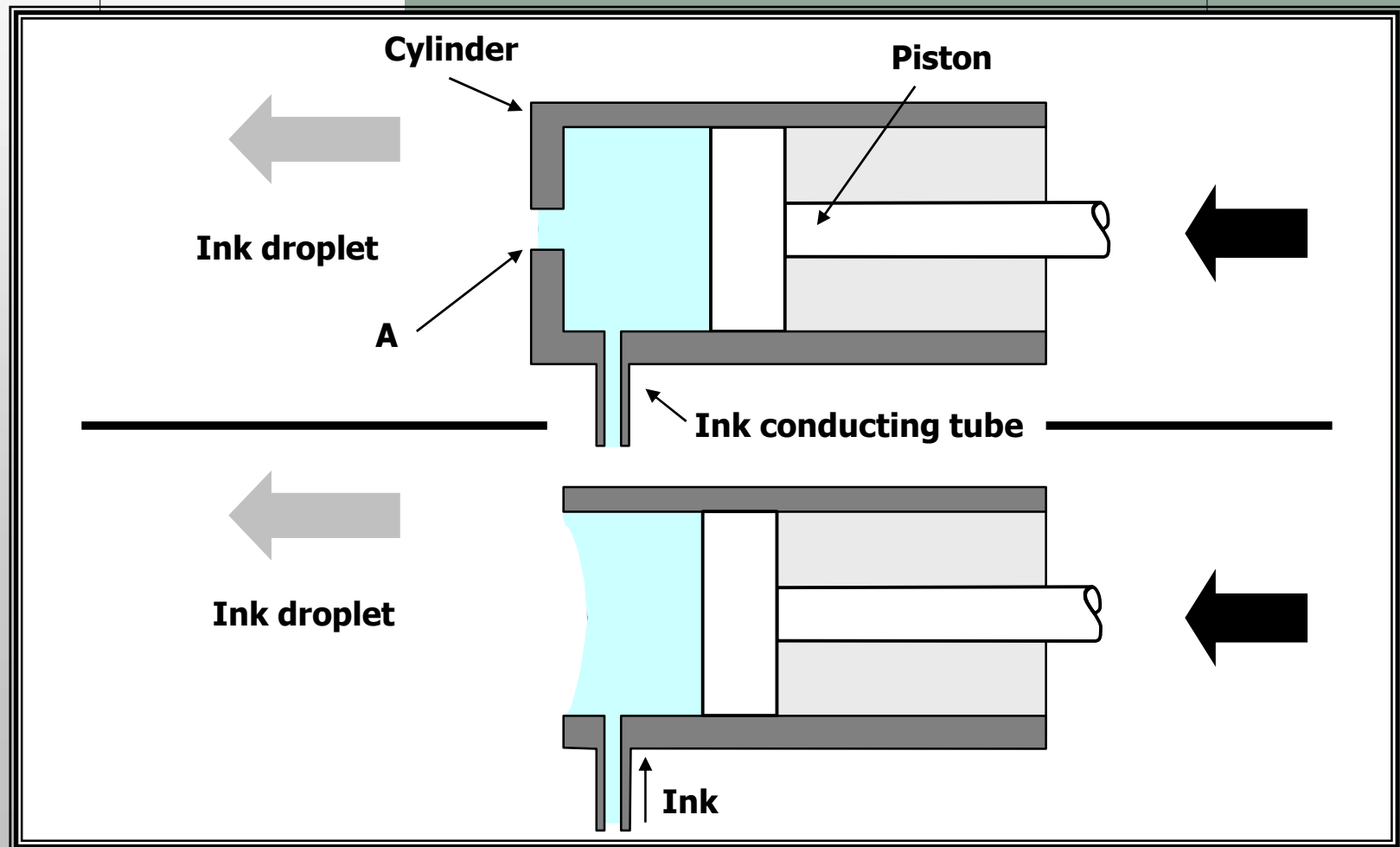
The FlatJet method

FlatJet



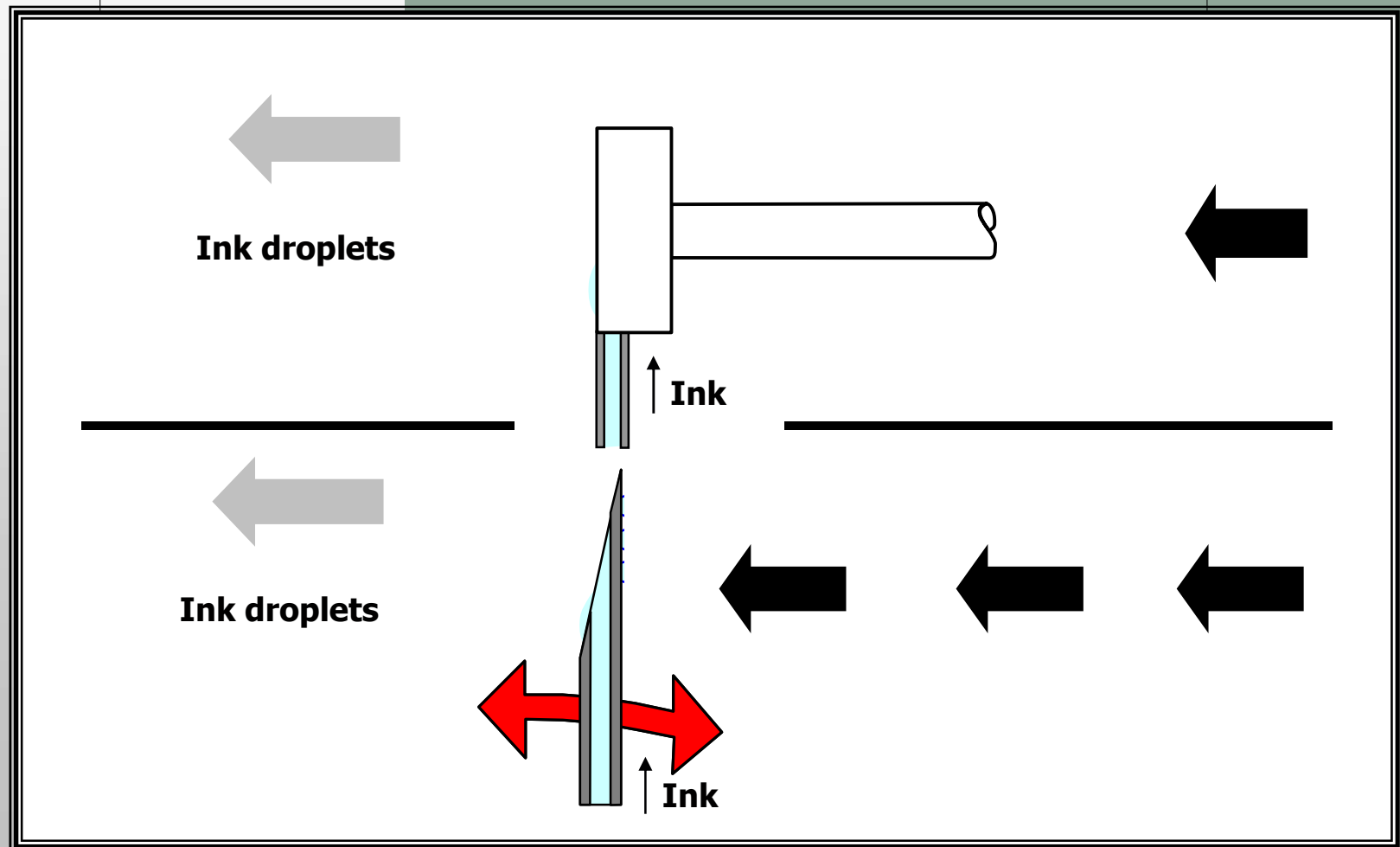
Principle

FlatJet



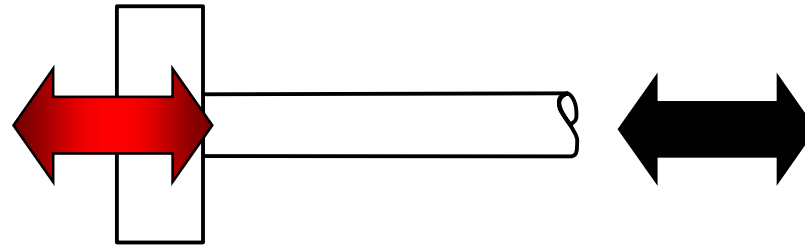
Principle

FlatJet

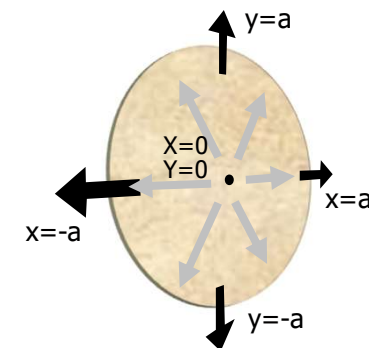
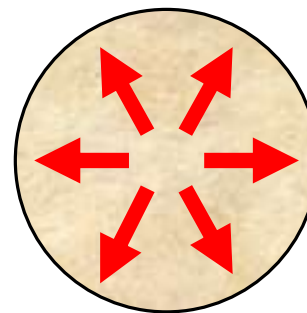


Principle

FlatJet



Piezoceramic transducer
(static deformation)



Principle

FlatJet

Piezoceramic transducer
(vibrating deformation)

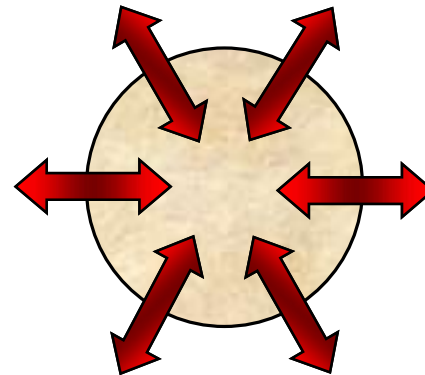
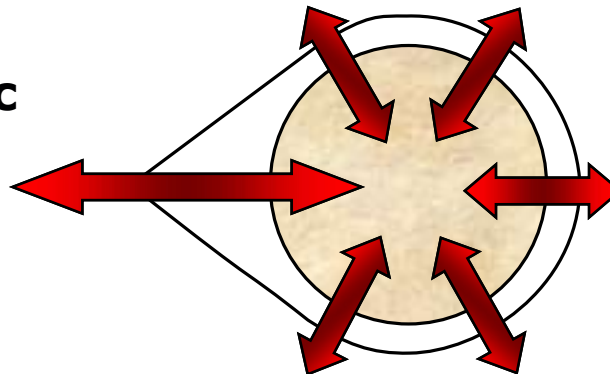


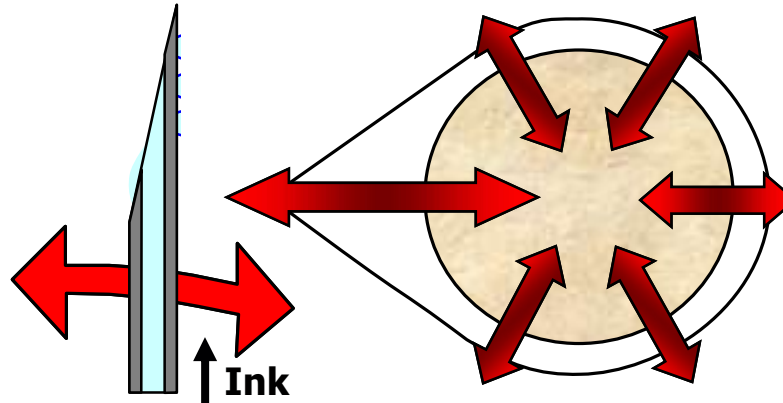
Plate resonator with piezoceramic transducer



Principle

FlatJet

Ink conducting and plate resonator

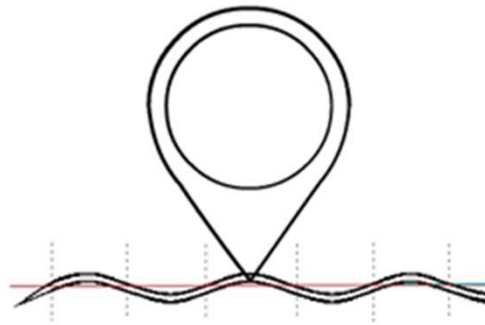


**FlatJet
head**

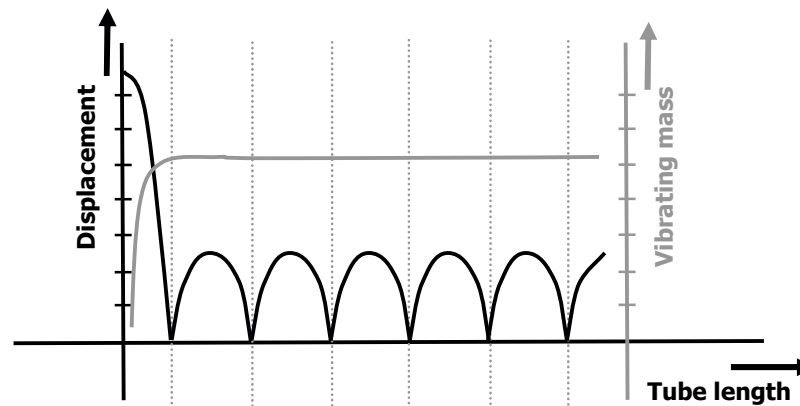
Principle

FlatJet

Overture Resonance

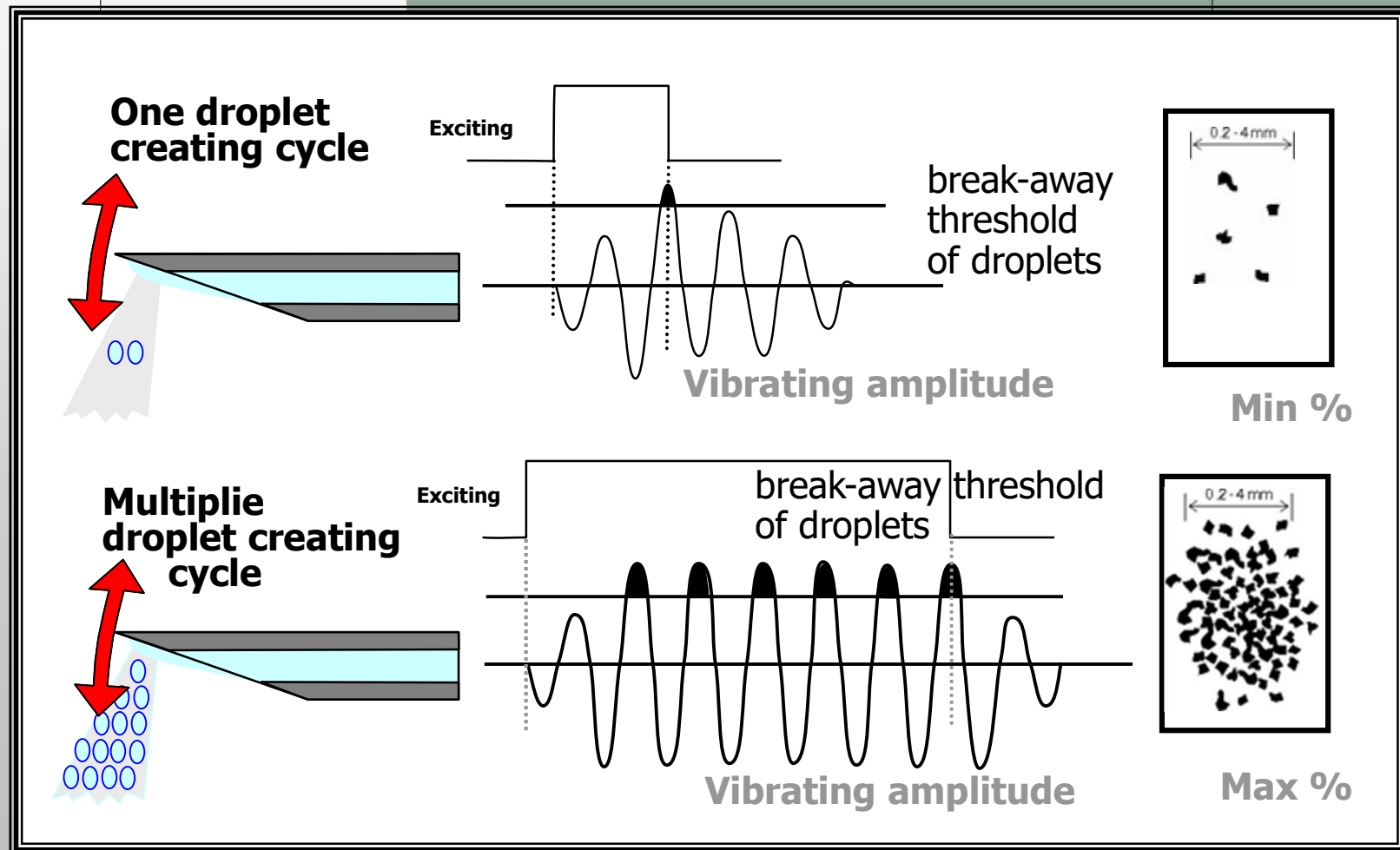


Variation of the vibrating amplitude



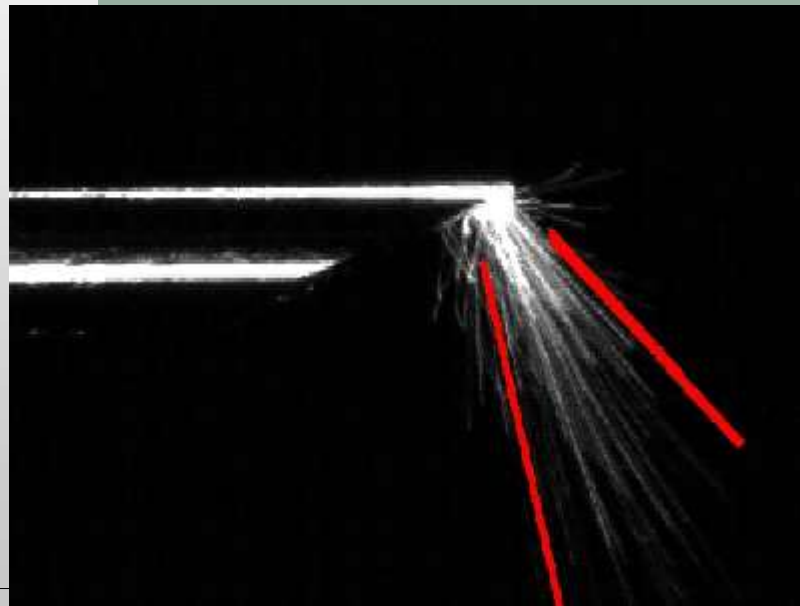
Principle

FlatJet



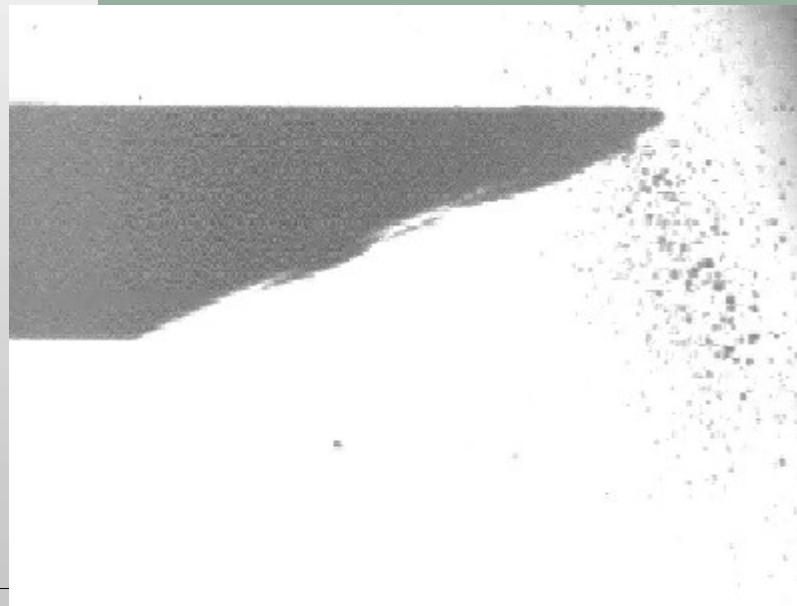
Ejected ink beam

FlatJet



Ejection process

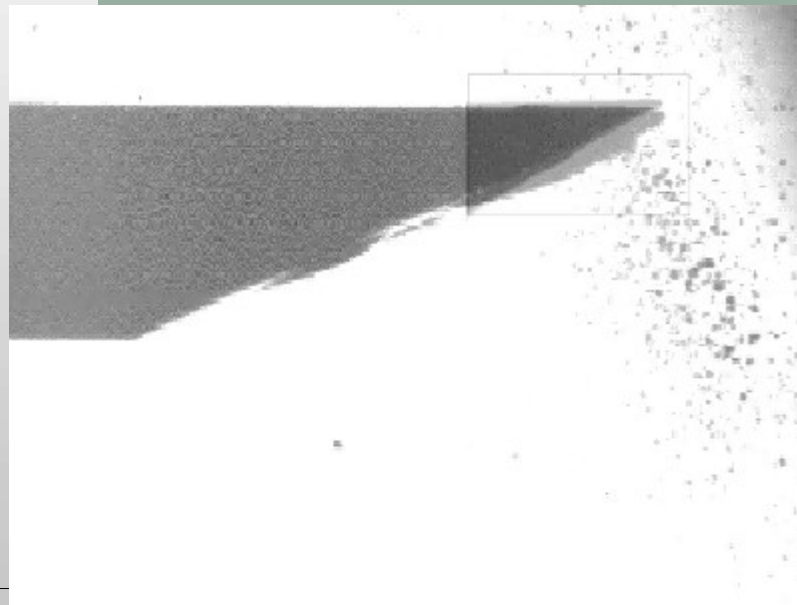
FlatJet



Microscopic shot with high speed camera,
with shifted exposure phases

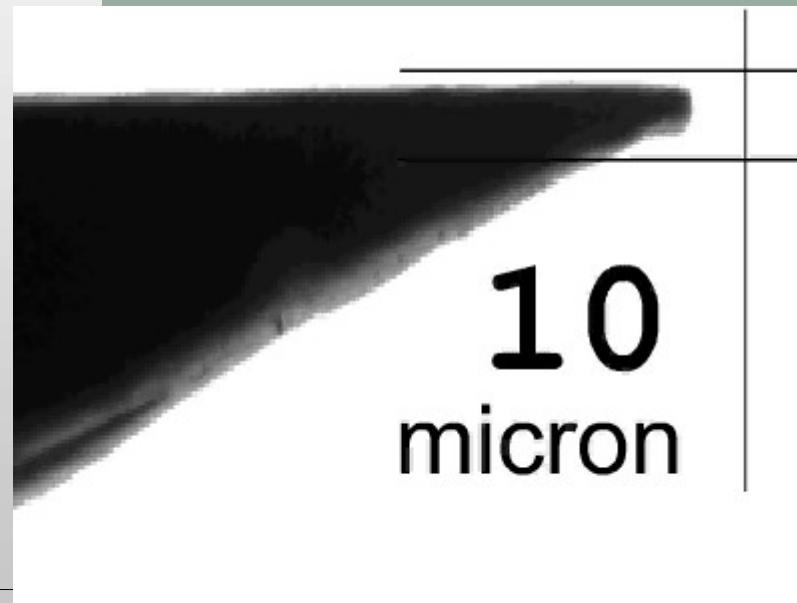
Ejection process

FlatJet



Extent of deformation at the tip

FlatJet



Microscopic shot with stroboscopic
backlight, shifted phase

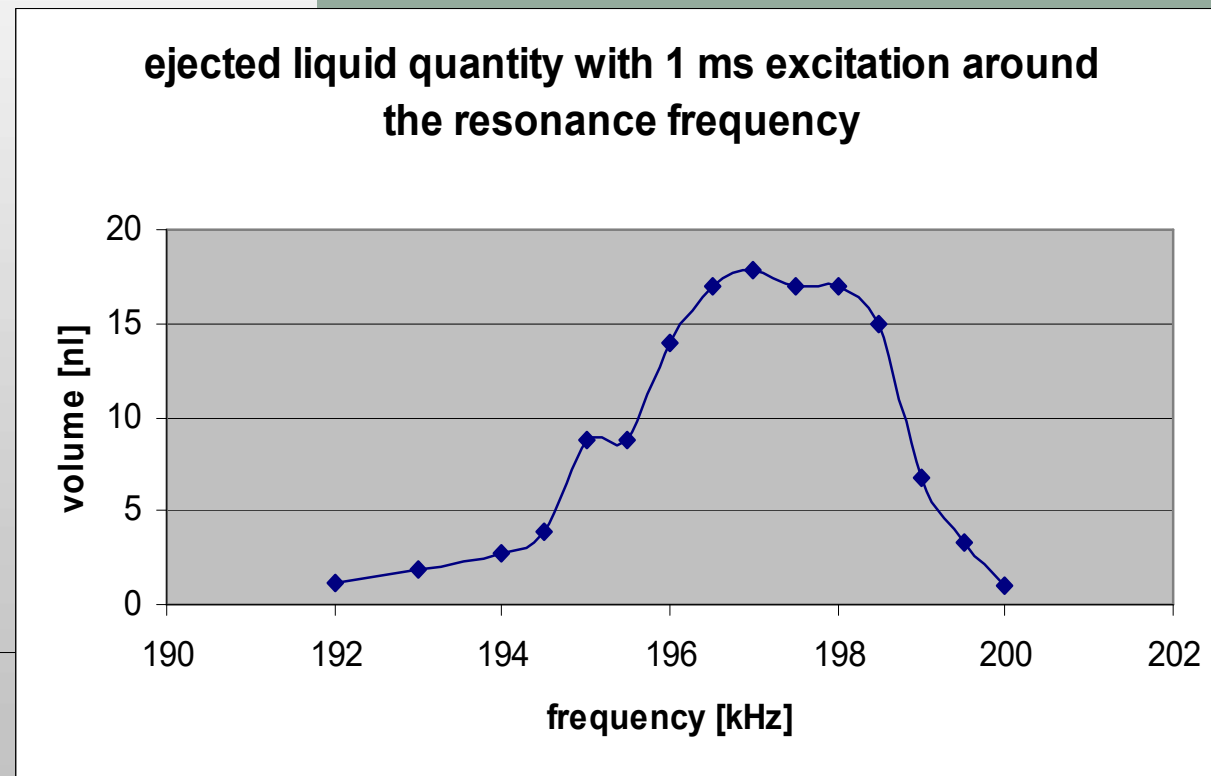
Local speed and acceleration at the tip

FlatJet

- At 200 kHz frequency the periodical speed of the tip surface is about **6 m/s**
- The acceleration at the dead point exceeds the **1.000.000 g**

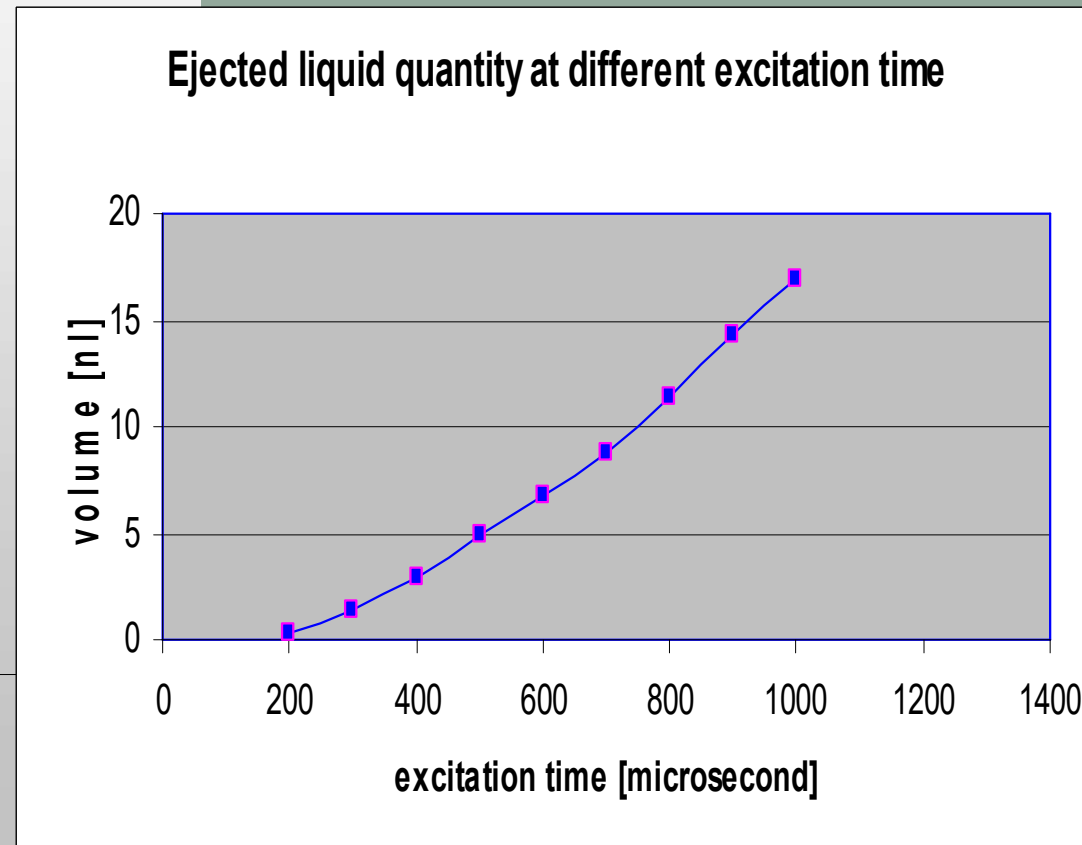
Ejected volume versus driving frequency

FlatJet



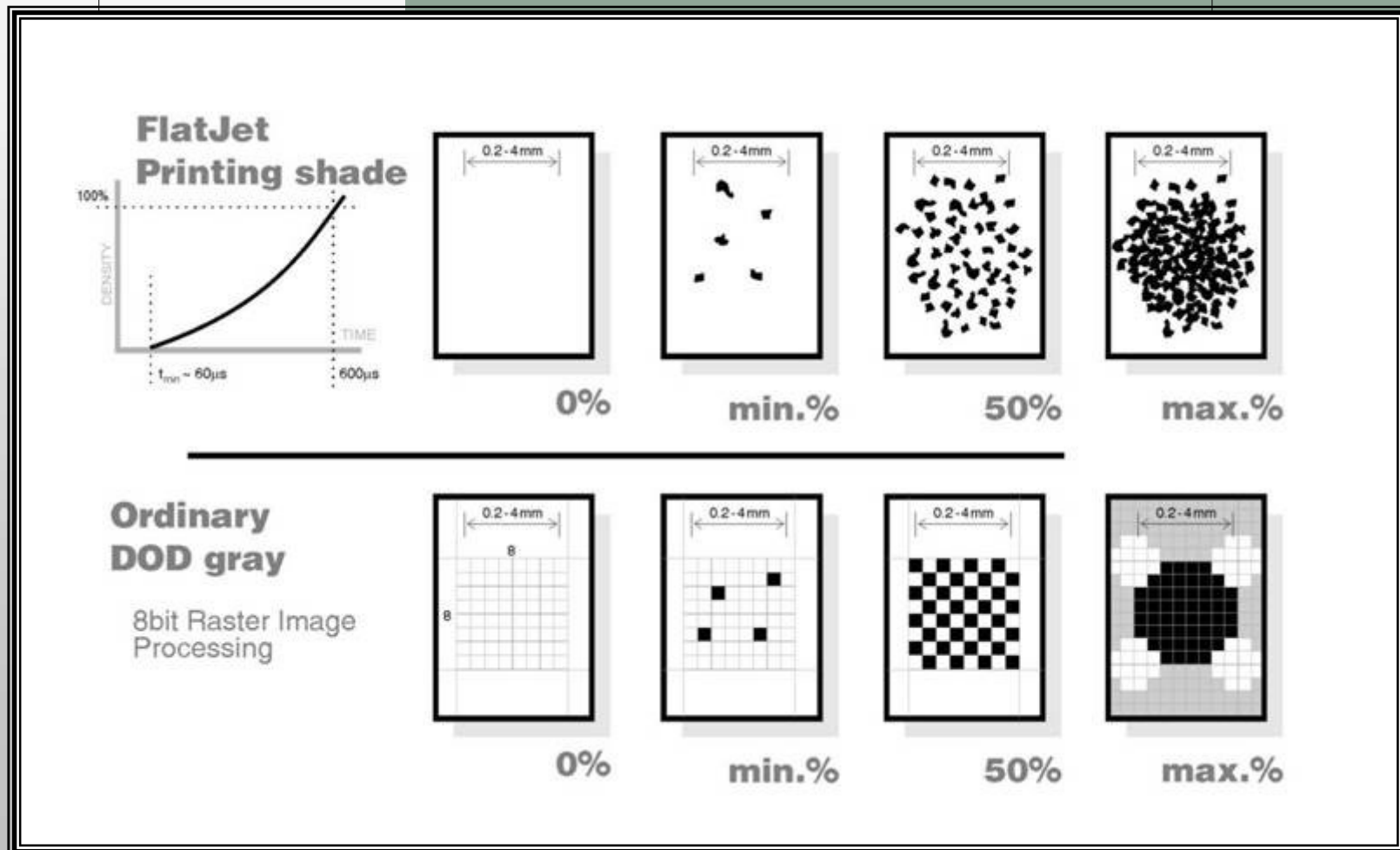
Ejected volume versus activating time

FlatJet



Pixel structure

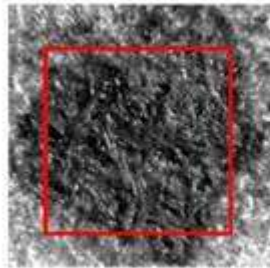
FlatJet



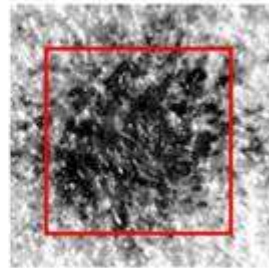
Pixel structure

FlatJet

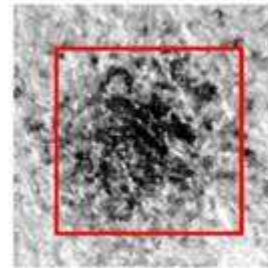
1mm x 1mm (FlatJet 25 dpi mode)



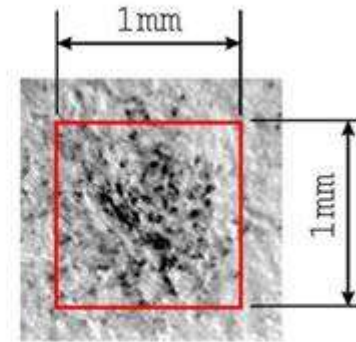
300 μ s



200 μ s

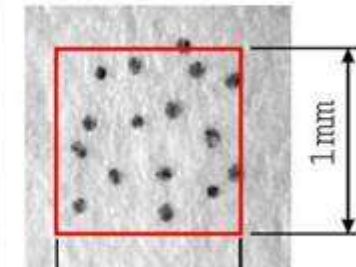
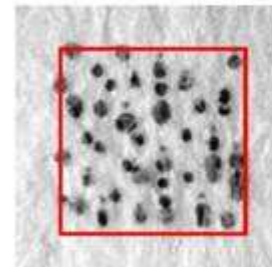
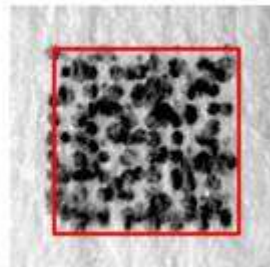
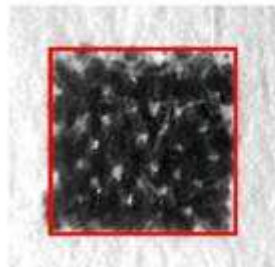


150 μ s



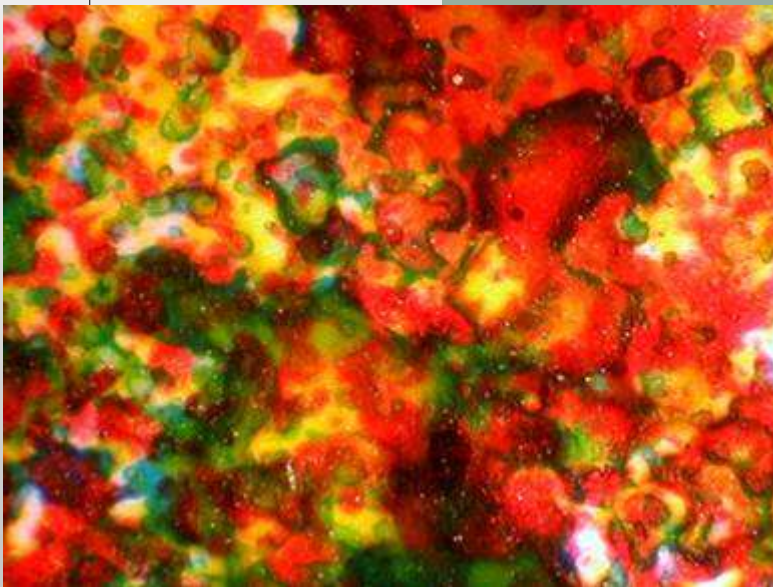
75 μ s

1mm x 1mm (1000 dpi type DOD Printer)



Color mode

FlatJet



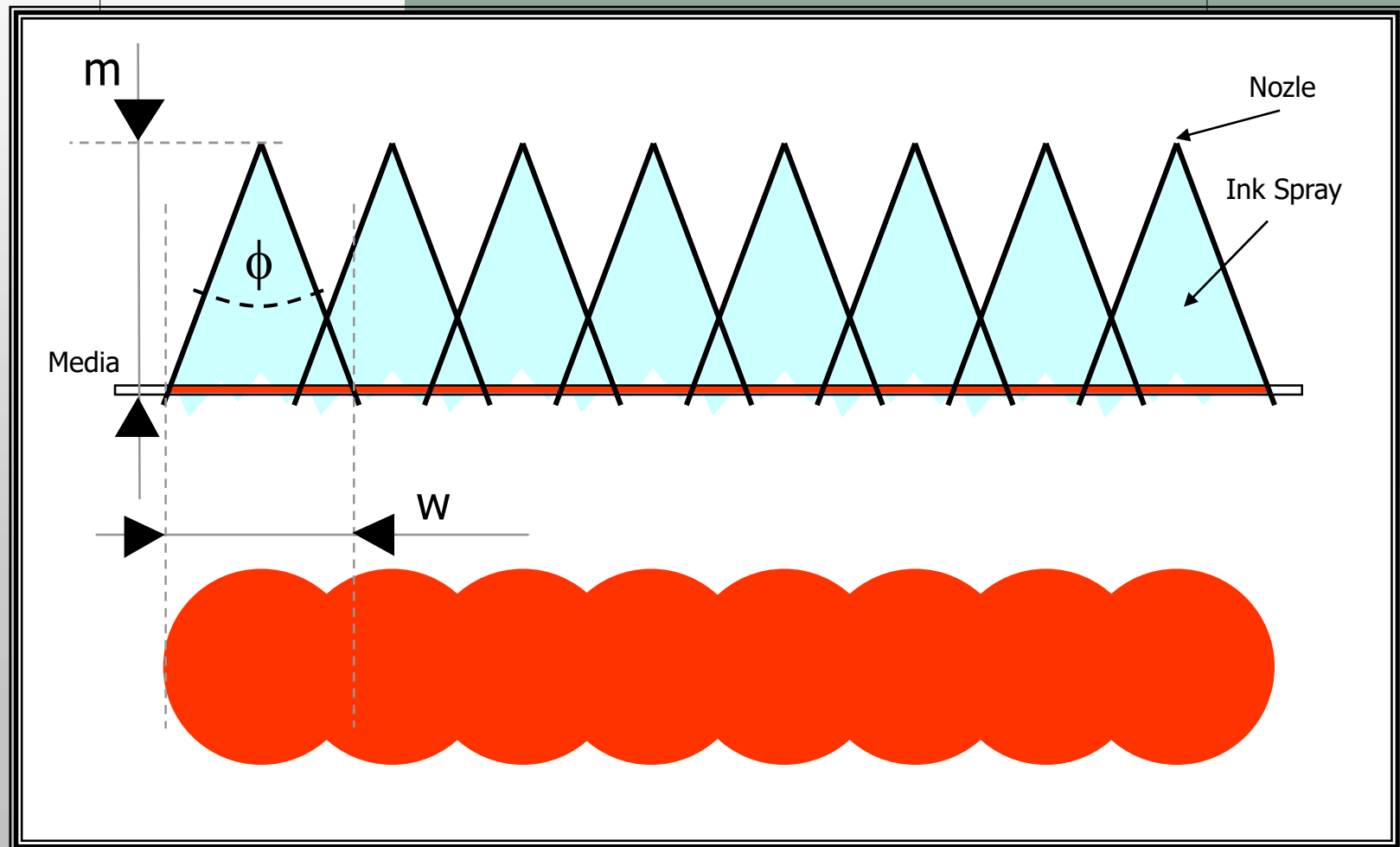
FlatJet



Raster color

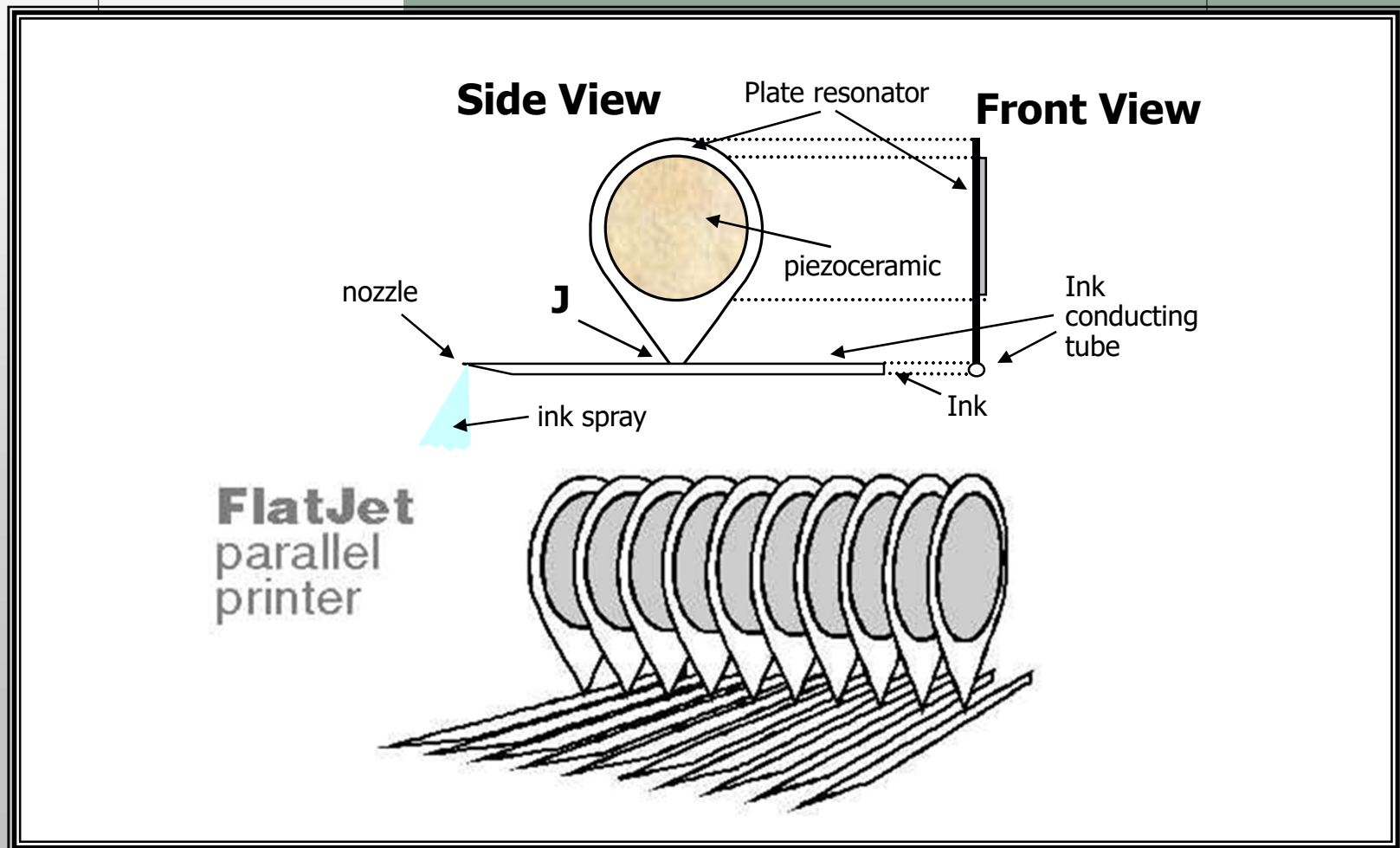
Pixels Size

FlatJet



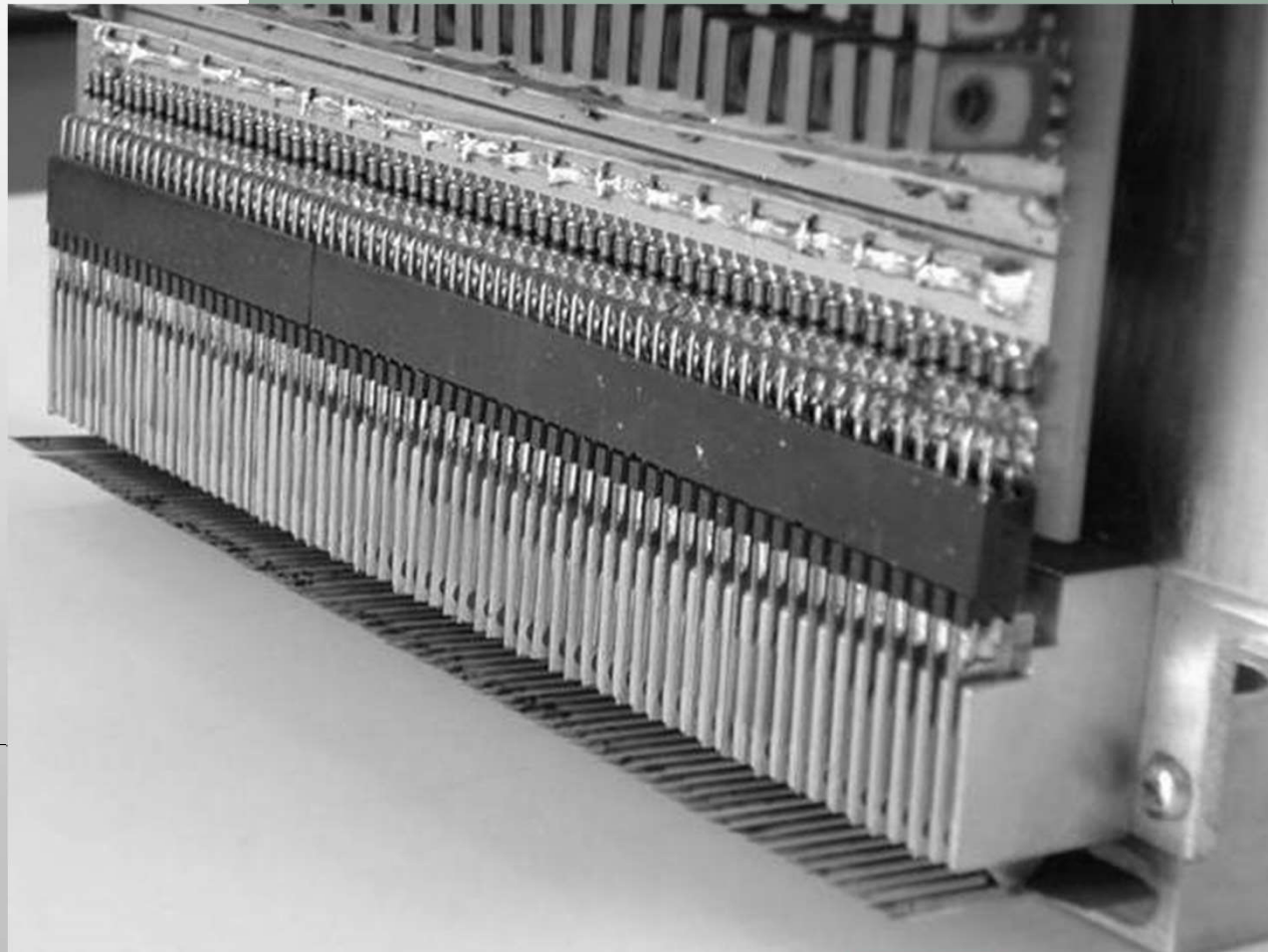
Principle

FlatJet

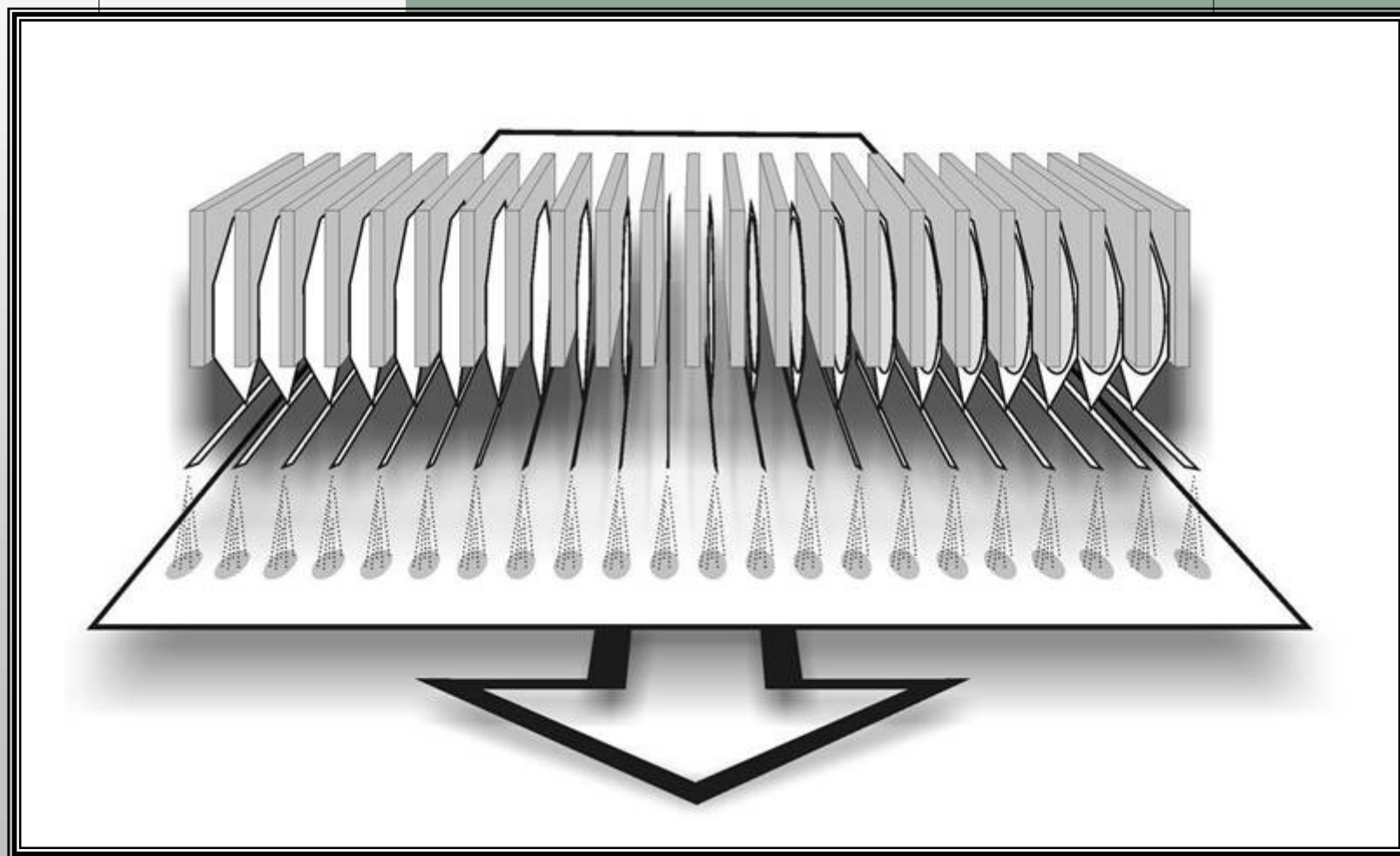


64 head
test printing bar

FlatJet



FlatJet



Planned media-wide printer

FlatJet



Application fields

FlatJet

- Printing on ordinary materials
- Printing on special materials
- Different applications
 - Chemical, Pharmaceutical or Microbiological dispensers
 - Moisturizers

Printing on ordinary materials

FlatJet

- Industrial media-wide large-format ink-jet printing
- Low cost media, low cost inks & low operating costs
- Wide variety of media & inks
- Computer to print technology

Printing on special materials

FlatJet

- Ceramics
- Glass
- Wood
- Leather
- Concrete
- Wallpaper
- Corrugated paper
- Plastics
- Metals
- ...etc.

FlatJet

- ... for perfect halftone printing
- 
- 
- chromoTEX**
DIGITAL TEXTILE PRINTING SYSTEM

New Flatjet Technology

The **Zimmer Chromatic** line is equipped with the revolutionary new **Flatjet** technology.

In comparison,

"drop-on-demand" and "continuous" jetter systems generate droplets formed in water cells, in order to achieve continuous lines, mixed colors with lower costs.

Such processes require very high printing resolutions, very small nozzles and special drying/evaporation ink and result in slow production speeds.

Flatjet technology is a drying system instead of a printing system.

It allows directly the requested density of ink onto the fabric, directly adjusted to the μ profile.

No need to generate a print, and no need for a high-dryer stage (heated surface).

Advantages

Easy-to-quick design change, perfect harmony always (temperature, pressure, etc.), this machine is ideal for many special applications.

The **Chromatic** line and the **Flatjet** technology is a new 3G process development and production of **Zimmer** tools.

The **Flatjet** nozzles are - compared to all other jetter systems - rather large, and therefore no nozzle clogging happens, the specific ink is required.

The unique mechanical design of the **Flatjet** system results in a maximuming speed and flexibility of the complete system as well as in low wearing cost due to an standard BGA system.

Continuous print speed with super flat fabrics

0.6-1.87

10% density

50% density

90% density

Continuous development for "new" applications of the **Flatjet** technology is going on...

Zimmer
ASTRIA

First Industrial Application

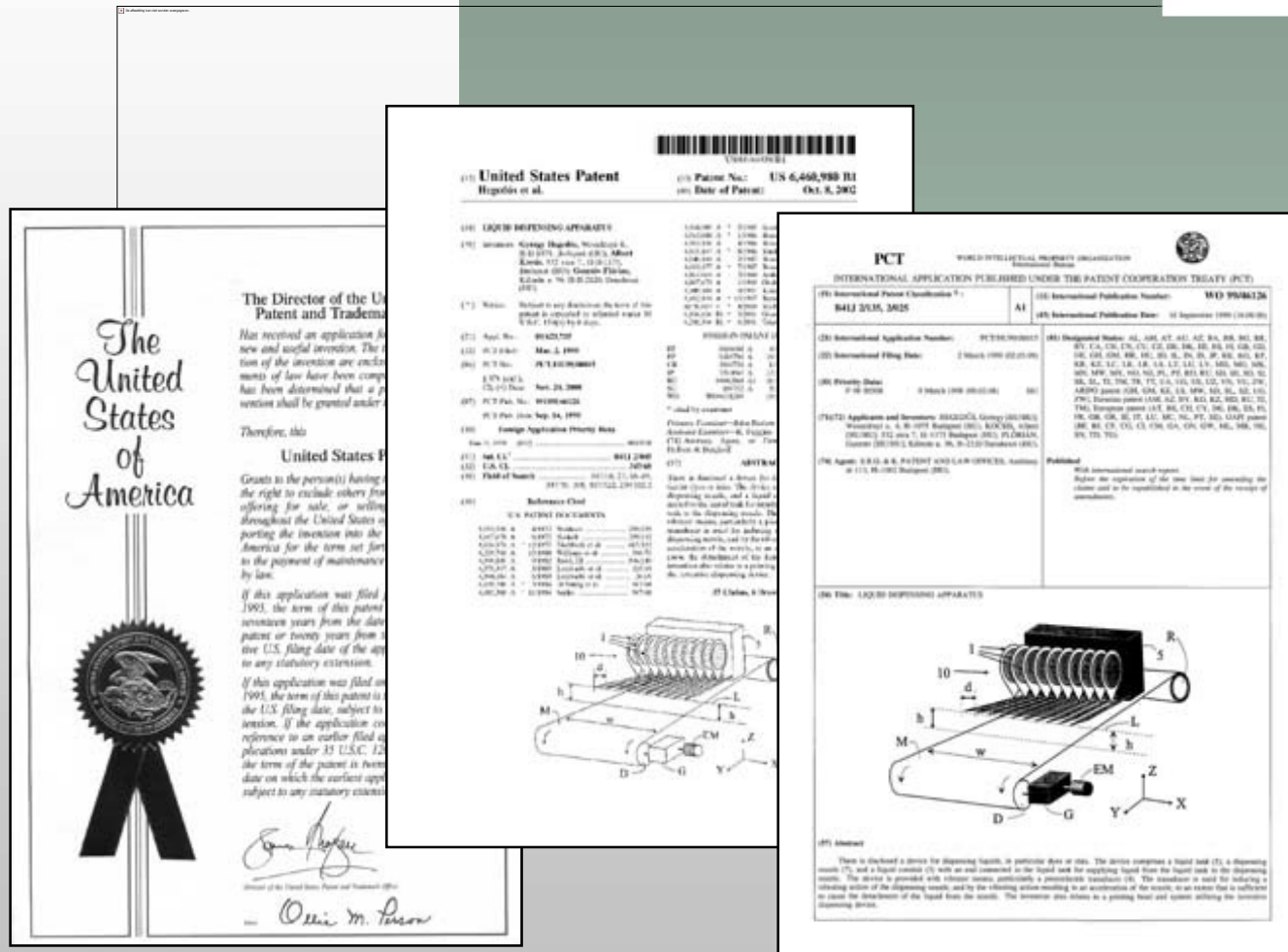
FlatJet

- Zimmer GmbH (A) Chromotex Textile Printer



Patents

FlatJet



U)(DE)(GB)(FR)(AT)(IT)(BE)(NL)(ES)(CH)(CA)(AU)(JP)

Hopes and Expectations

FlatJet

- A NEW TECHNOLOGY CAN SUCCEED IF IT IS QUICKER OR BETTER OR CHEAPER
- THE FLATJET CAN BE QUICKER & BETTER & CHEAPER

QUICKER

FlatJet

- Possible **1 sq. meter** per second printing speed
- The printing width can be increased without limits

BETTER

FlatJet

- High tone / color resolution
(possibly **256 shade** in a pixel)
- High color saturation **pigmented** inks
- Environmentally friendly **water based** inks
- High tolerance in ink parameters
(viscosity up to **15 mPas**)

CHEAPER

FlatJet

- Low cost **media**
- Low cost **inks**
- Low **operating** costs
- Quick return of **investment**