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2018 METRO PRODUCTION CONFERENCE

May 31 ~ June 3 • Saddlebrook Conference Center, Wesley Chapel, FL





Understanding Rheology

What are the basic differences between open fountain and injector inks?

Presented By;
Tobias Steik
Director of Mobile Diagnostics
Central Ink Corporation



Lets clarify the definitions of Rheology and Viscosity

● Rheology

- The study of the deformation and flow of matter.

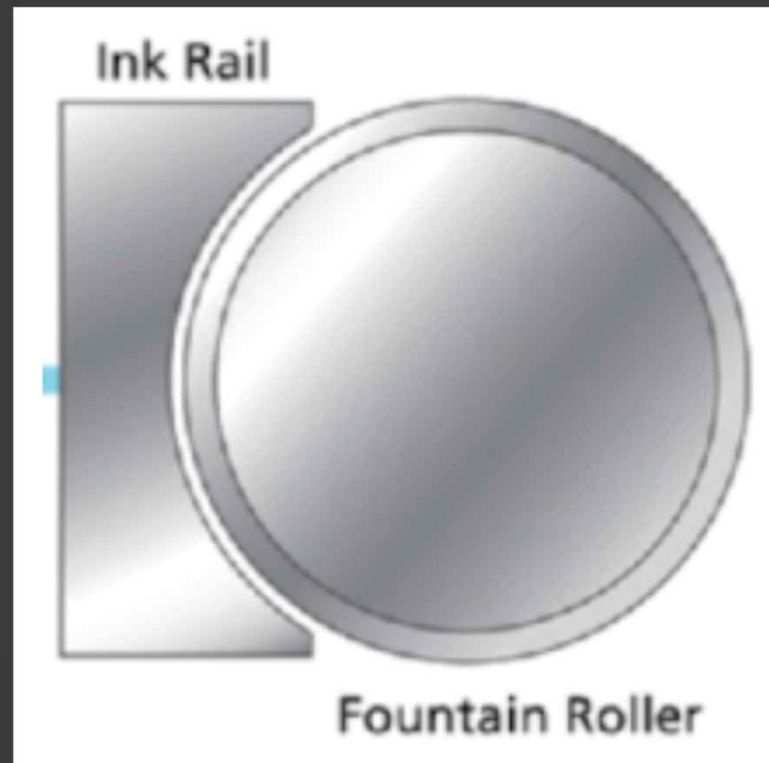
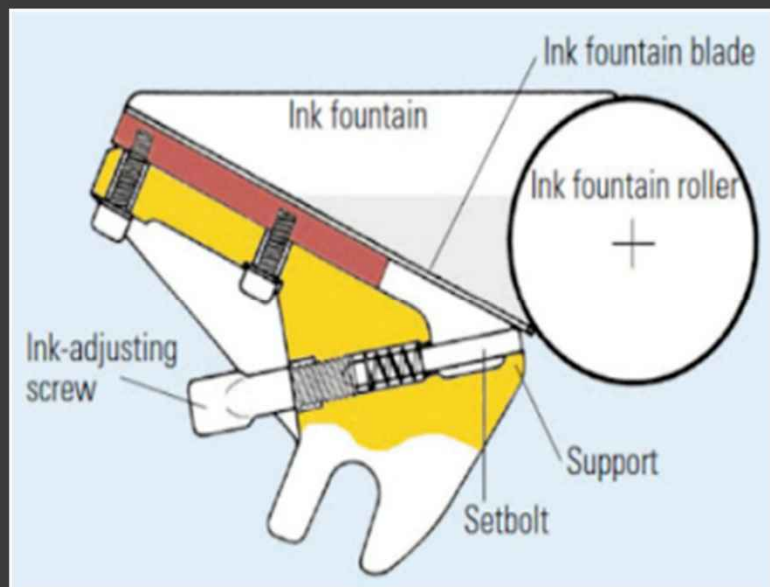
● Viscosity

- The property of a fluid that resists the force tending to cause the fluid to flow.

Why is Rheology so important ?

- ⊙ Inking system
 - Open fountain
 - Rails, Page Packs, Cassettes
 - Proper ink film in roller train
- ⊙ Pumping
 - Rotary
 - Piston
 - pressure
- ⊙ Dot Structure
- ⊙ Transfer
- ⊙ Flow
 - Cold Flow
 - Leveling

Fountain & Rail Illustrations



Rheometer



Measuring Viscosity



Cone & Plate Viscometer



Falling Rod Viscometer

Measuring water emulsification



Lithotronic



Duke Water Emulsification
Tester

Magenta flow test

Open Fountain & Injector



What can influence the viscosity and structure of an ink?

- ⦿ Raw materials (*proper selection is key!*)
 - Organo clays
 - Oils
 - Pigments
 - Resins
- ⦿ Pressure
 - Pumping design
 - Sheer
 - Pipe
- ⦿ Environmental influences
 - Temperature
 - Mechanical
 - Roller settings
 - Squeeze

What can influence the viscosity and structure of an ink?

Continued

- Outside contaminants
 - Paper
 - Fibers
 - Calcium
 - Dust
 - Chemicals
 - Cleaners
 - solvents
- Water
 - Fountain solution
 - Dose
 - Temperature
 - Surface tension
 - Chemical composition
 - Gum, surfactants
 - Biological influences
 - Water source

Hydro Treated Mineral Oil flow test (30 °F difference)



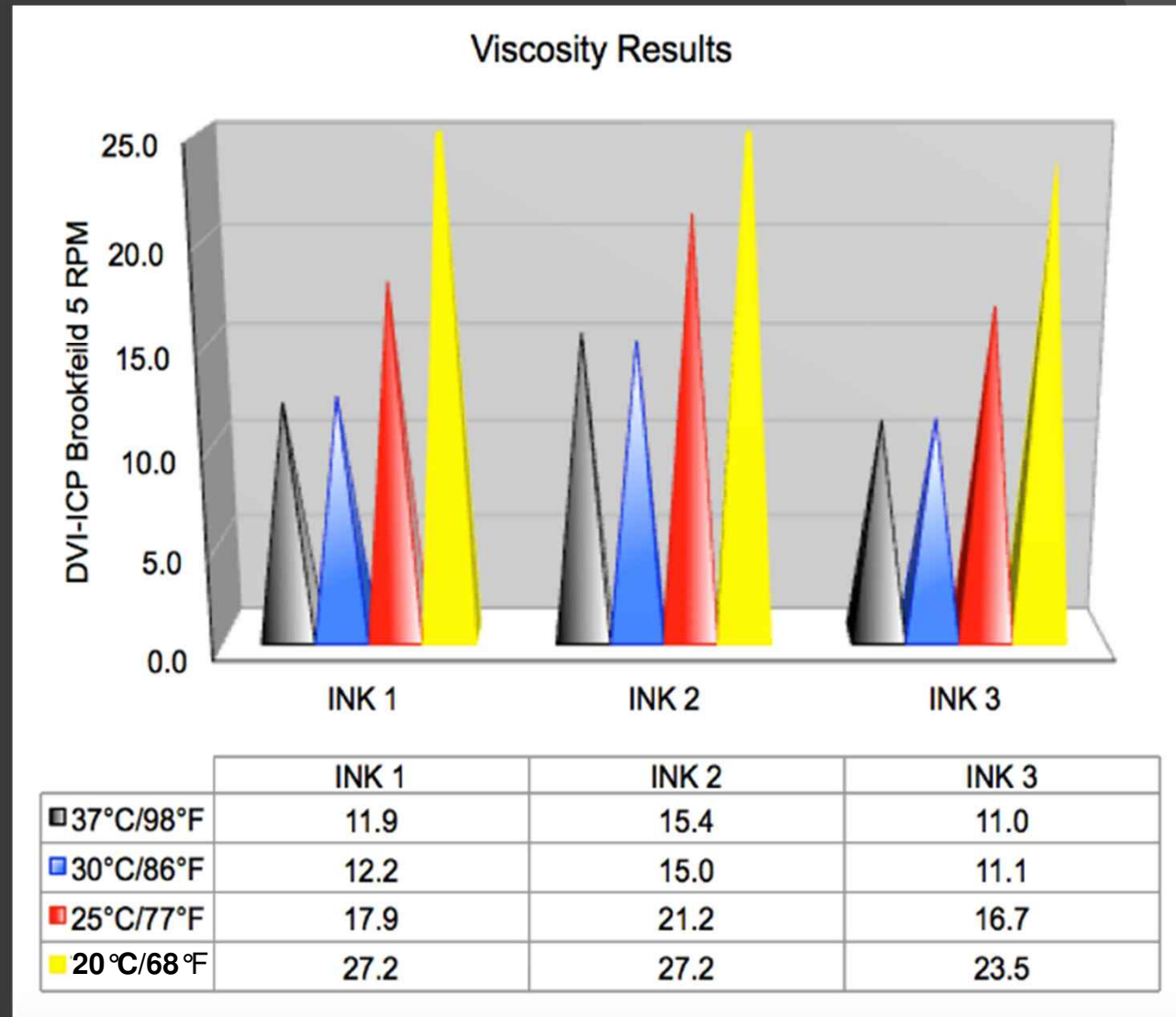
● Slow Motion

Temperature influence on cold set ink viscosity study

	INK 1 Process Magenta	INK 2 Process Magenta	INK 3 Process Magenta
DV-ICP Brookfield @ 37° C (98F) 20 rpm Reading	11.9	15.4	11.0
DV-ICP Brookfield @ 37° C (98F) 5 rpm Reading	4.4	5.4	3.3
DV-ICP Brookfield @ 37° C (98F) Structure Index	66	64	58
DV-ICP Brookfield @ 30° C (86F) 20 rpm Reading	12.2	15.0	11.1
DV-ICP Brookfield @ 30° C (86F) 5 rpm Reading	4.5	5.3	3.4
DV-ICP Brookfield @ 30° C (86F) Structure Index	66	65	59
DV-ICP Brookfield @ 25° C (77F) 20 rpm Reading	17.9	21.2	16.7
DV-ICP Brookfield @ 25° C (77F) 5 rpm Reading	6.3	7.0	4.8
DV-ICP Brookfield @ 25° C (77F) Structure Index	64	62	57
DV-ICP Brookfield @ 20° C (68F) 20 rpm Reading	27.2	27.2	23.5
DV-ICP Brookfield @ 20° C (68F) 5 rpm Reading	8.7	8.7	6.6
DV-ICP Brookfield @ 20° C (68F) Structure Index	61	61	55

	INK 1 Process Magenta	INK 2 Process Magenta	INK 3 Process Magenta
DV-ICP Brookfield @ 15° C (59F) 20 rpm Reading	45.3	40.7	36.5
DV-ICP Brookfield @ 15° C (59F) 5 rpm Reading	13.7	12.6	10.1
DV-ICP Brookfield @ 15° C (59F) Structure Index	59	60	55
DV-ICP Brookfield @ 10° C (50F) 20 rpm Reading	75.7	64.0	59.9
DV-ICP Brookfield @ 10° C (50F) 5 rpm Reading	22.6	19.6	16.6
DV-ICP Brookfield @ 10° C (50F) Structure Index	58	59	55

Temperature influence on cold set ink study graph



Thank You!

