J.M. FRY INKS
A FAMILY COMPANY

INK 101

THE BASICS OF

INK, pH & VISCOSITY

A practical, pressroom-focused guide to understanding water-based ink chemistry and controlling the variables that drive print performance.

BETTER CHEMISTRY. BETTER COLOR. BETTER RESULTS.

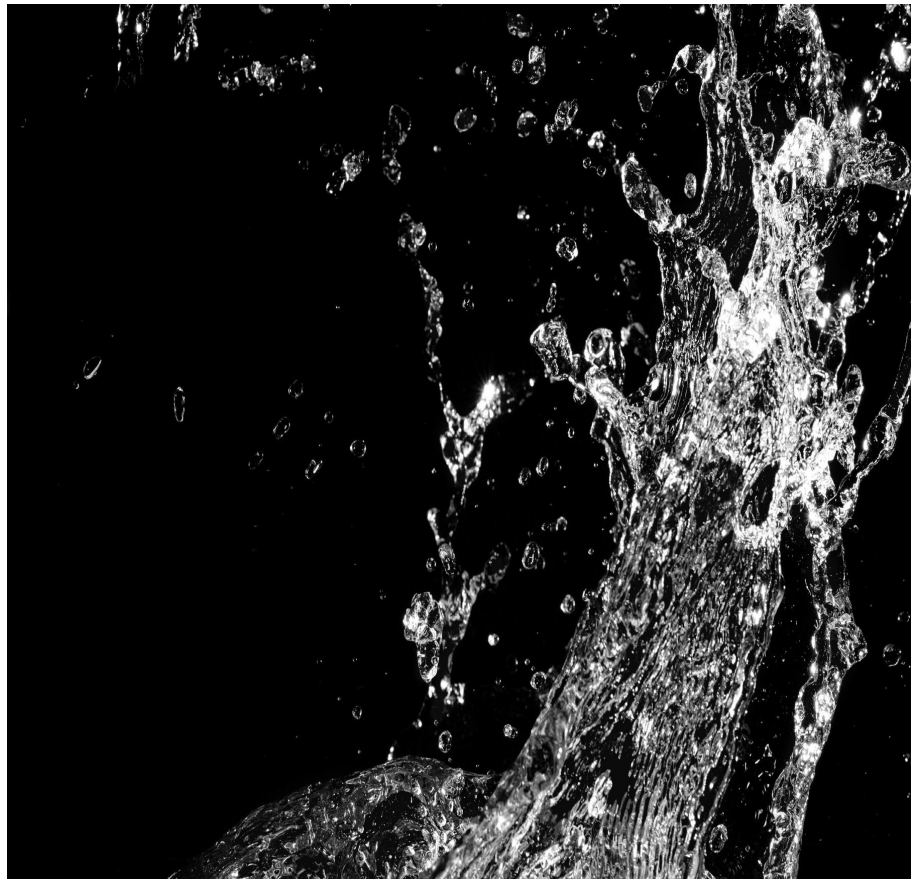
NAME • **POSITION**

What are water-based inks?

A stable water-borne system where solids, resins, surfactants and additives work together.

WATER-BASED INK

A stable dispersion in water of very small solid particles in a resinous vehicle, supported by surfactants and other performance additives.



WATER + RESIN + PIGMENT + ADDITIVES = CONTROLLED PRINT PERFORMANCE

What is ink made of?

Every ingredient has a role. The performance comes from how those parts work together.

RESIN / VEHICLE

Creates the system and drives adhesion, resistance and printability.

PIGMENT

The colorant. Grade and shade influence strength, appearance and cost.

ADDITIVES

Fine-tune rub, transfer, foam control, wetting and other performance.

SOLVENTS / VOLATILES

Water is the primary solvent; alcohol can help accelerate drying.

EVERY COMPONENT HAS A JOB. BALANCE THEM FOR CONSISTENT PRINT.

Resin sets the foundation

The vehicle system dictates the primary properties of a printing ink.

RESIN / VEHICLE / EXTENDER

The system dictates the primary properties of a printing ink:

- Product resistance
- Adhesion
- Printability
- Ink transfer from system → anilox → plate → board

THE VEHICLE CARRIES THE COLOR — AND SETS THE RULES FOR PERFORMANCE.

Pigment defines the color

Pigment may be dry powder or pre-dispersed. It is often the most expensive raw-material portion of an ink.

WHAT YOU NEED TO KNOW

- Many different grades and shades are available.
- Pigment choice changes strength, shade and durability.
- Performance demands drive raw-material cost.

GENERAL RULE:
The more you want the pigment to do, the more expensive it — and the ink — will be.

PIGMENT DRIVES COLOR. PERFORMANCE REQUIREMENTS DRIVE COST.

Additives fine-tune the system

Waxes, transfer aids, defoamer, surfactants, silicone and specialty performance aids enhance the ink system.

COMMON ADDITIVE FAMILIES

- Waxes
- Transfer aids
- Defoamer
- Surfactants
- Silicone and specialty performance aids

WHAT THEY CAN IMPROVE

- Rub resistance
- Printability
- Adhesion
- Foam control
- Wetting and transfer

MORE IS NOT BETTER — use only what the system needs.

USE ADDITIVES WITH PURPOSE — NOT BY HABIT.

Solvents & volatiles

In water-based ink, water is the primary solvent. Alcohol can be used to accelerate drying speed.

60%

WATER / AMINES

Provide solubility and re-solubility.

40%

SOLIDS

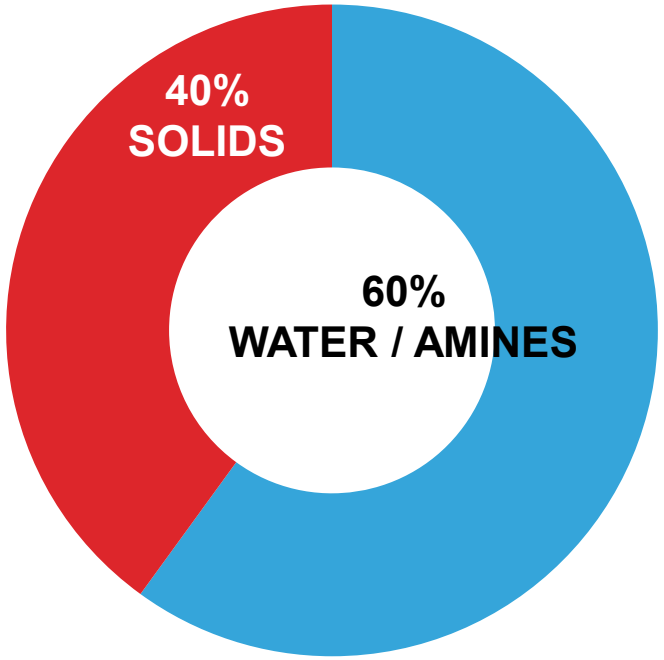
Pigment, polymer and/or filler.

Alcohol may be used as a drying-speed modifier.

CONTROL VOLATILES. CONTROL FLOW, DRYING AND RESOLUBILITY.

Typical water-based ink or coating

A practical way to think about the system: roughly 60% water/amines and 40% solids.



PIGMENT

Colorant

POLYMER / RESIN

Film formation

FILLER

Performance / cost

SOLIDS = combinations of pigment, polymer and/or filler.

KNOW WHAT IS IN THE MIX — THEN CONTROL WHAT CHANGES ON PRESS.

UNDERSTANDING

pH

pH is a chemistry-control tool — not just a number.

THE pH SCALE

8.5 – 9.5

FLEXO INKS

TOO LOW

Fast drying • instability • color drift

ON TARGET

Stable chemistry • repeatable performance

TOO HIGH

Slow drying • soft film • odor concerns

GET THE pH RIGHT. GET THE PERFORMANCE RIGHT.

How critical is pH control?

pH drift can create visible ink failure before the operator realizes chemistry has changed.

COLOR

Unstable color / burnout

TRANSFER

Harder to rewet and transfer

CLEANUP

Plate & anilox cleanup gets harder

VISCOSITY

Viscosity can drift with pH

CHEMISTRY DRIFT SHOWS UP AS PRINT DRIFT.

MEASURE EARLY. CORRECT SMALL CHANGES BEFORE THEY BECOME PRESS PROBLEMS.

What pushes pH off target?

Pressroom conditions can quietly destabilize ink chemistry during a run.

1

HEAT + LOW HUMIDITY

Heat and dry air accelerate water and amine loss.

2

DOCTOR BLADE SHEAR

Friction and mechanical energy add heat to the system.

3

OVER-AGITATION

Excessive mixing can accelerate chemistry changes.

4

UNCOVERED INK KITS

Open systems lose volatile components faster.

CONTROL THE ENVIRONMENT AROUND THE INK — NOT JUST THE INK ITSELF.

Low pH creates fast trouble

When pH drops below the control range, stability falls and the system can dry too fast.

LOW pH
< 8.8

FAST DRYING
LESS STABILITY
HARDER REWET

1. **Dries too fast**
   on anilox, plates or linerboard
2. **Less stable**
   on press
3. **Difficult to rewet**
   on plate
4. **Unstable color**
   shade can move
5. **Harder cleanup**
   resin can stick
6. **Viscosity rises**
   resin can "kick out"

LOW pH = LESS CONTROL, MORE STOPS, MORE CLEANUP.

High pH slows the system down

Too much alkalinity can create slow drying, soft film and odor-related problems.

HIGH pH
> 9.6

SLOW DRYING
SOFTER FILM
ODOR RISK

Slower drying

ink stays open longer

Softer film

reduced film strength

Color burnout

appearance can flatten

Viscosity decreases

flow can become too loose

Odor problems

excess amine / alkalinity

Upper-end risk

avoid running at the edge

HIGH pH TRADES DRYING SPEED AND FILM STRENGTH FOR EXCESS ALKALINITY.

Correct pH keeps the press moving

Balanced chemistry supports re-solubility, easier cleanup, stable viscosity and stable color.

CORRECT pH

8.8 – 9.6

TARGET THE MIDDLE — NOT THE EDGES.

GOOD RESOLUBILITY

on plates & roller

FEWER WASH STOPS

more uptime

EASY CLEANUP

less labor

STABLE VISCOSITY

repeatable transfer

STABLE COLOR

more consistent results

STABLE pH → STABLE VISCOSITY → STABLE COLOR.

Take care of pH. Save time and money.

Small chemistry habits compound into meaningful pressroom savings.

1

CLEANUP GETS EASIER

Plate and anilox cleanup is much easier.

2

SHELF INK STAYS USABLE

Ink on the shelf doesn't come back as mud.

3

RESTORE AT BOTH ENDS

Restore pH at the end of the run as well as the beginning.

4

SAVE TIME + MONEY

Every avoided stop and cleanup adds up.

GOOD pH CONTROL IS PROCESS CONTROL — AND PROCESS CONTROL PAYS.

Viscosity is resistance to flow

The higher the viscosity, the less easily ink flows — and an ink's pH influences its viscosity.

FLOW

A measure of a liquid's ability to resist flow.

Running viscosity affects how much ink is transferred to the stock.

HIGHER VISCOSITY	More resistance to flow
TARGET VISCOSITY	Balanced flow + transfer
LOWER VISCOSITY	Less resistance to flow

FLOW CHANGES TRANSFER. TRANSFER CHANGES PRINT.

High vs. low viscosity

Running viscosity changes ink transfer, drying and print strength.

HIGH VISCOSITY

- Excess ink transfer
- Tracking
- Smudging
- Slow drying

LOW VISCOSITY

- Weaker print
- Dries too fast
- Foaming
- Poor coverage

TARGET VISCOSITY GIVES YOU CONTROLLED INK TRANSFER, DRYING AND COVERAGE.

Viscosity changes the color you see

Ink transfer changes with viscosity — even when the formula itself does not.

LOW VISCOSITY

Less ink transfer

WEAKER / LIGHTER

Viscosity changes transfer → transfer changes apparent color strength.

STANDARD VISCOSITY

Balanced ink transfer

TARGET COLOR

Viscosity changes transfer → transfer changes apparent color strength.

HIGH VISCOSITY

More ink transfer

DARKER / HEAVIER

Viscosity changes transfer → transfer changes apparent color strength.

SAME INK. DIFFERENT VISCOSITY. DIFFERENT COLOR RESULT.

Build a repeatable control routine

Document checks. Restore chemistry. Repeat at a consistent cadence.

1

BEFORE JOB

Check / restore pH and viscosity before starting a new job.

2

EVERY 30 MIN

Check pH and viscosity throughout the run.

3

END OF RUN

Restore pH at the end of the run.

4

DOCUMENT

Record the checks so trends become visible.

CONSISTENCY COMES FROM A ROUTINE YOU CAN REPEAT — AND VERIFY.

CHECK IT. RECORD IT. RESTORE IT. REPEAT IT.

Don’t let your ink enter the danger zone

Keep pH away from both the lower and higher ends of the acceptable operating range.

WORKING CONTROL RANGE

RUN IN THE MIDDLE OF THE RANGE

Avoid operating near either edge. The closer you get to the limits, the less margin you have for normal pressroom drift.

PROTECT THE MIDDLE. PROTECT THE PROCESS.

QUESTIONS?

LET'S TALK INK.

NAME

TITLE | J.M. Fry Inks

EMAIL

PHONE

BETTER CHEMISTRY.

BETTER COLOR.

BETTER RESULTS.

CONTROL THE VARIABLES.
CONTROL THE OUTCOME.