CARLISLE
FLUID TECHNOLOGIES

FINISHING EDUCATION UNIVERSITY

Manual Gun Solutions and Applications

Webinar

9/22/2021

CARLISLE FLUID TECHNOLOGIES

Manual Gun Solutions and Applications Overview

- Overview of Carlisle Fluid Technologies & Brands
- Applicator Technologies Overview
- Atomization Background
- Air Atomization
- Hydraulic Atomization
- Transfer Efficiency
- Electrostatics
- Typical Markets/Substrates
- Questions

BGK A CARLISLE BRAND | BINKS A CARLISLE BRAND | DeVILBISS A CARLISLE BRAND | Hosco A CARLISLE BRAND | ms A CARLISLE BRAND | Ransburg A CARLISLE BRAND

Company Overview

CARLISLE CONSTRUCTION MATERIALS

CARLISLE INTERCONNECT TECHNOLOGIES

CARLISLE FLUID TECHNOLOGIES

CARLISLE FLUID TECHNOLOGIES

- BGK — A CARLISLE BRAND
- BINKS — A CARLISLE BRAND
- DeVILBISS — A CARLISLE BRAND
- Hosco — A CARLISLE BRAND
- ms — A CARLISLE BRAND
- Ransburg — A CARLISLE BRAND

Applicator Technology Types and Selection

Air Atomization

Air used to impinge on fluid column
- Atomization air forms droplets
- Fan air shapes spray pattern

Manual and automatic versions available

Conventional Air Spray
- Low Volume, High Pressure
- Air cap pressure typ. 30 – 60psi

HVLP
- High Volume Low Pressure
- Air cap pressure less than 10 psi

TransTech / Compliant / LVMP
- Low Volume, Medium Pressure
- Air cap pressure typ. 20 – 40 psi

Hydraulic Atomization

Fluid forced through fixed orifice at high pressure
- Fluid flow controlled by PSI and orifice size
- Pattern size dictated by nozzle

Manual and automatic versions available

Air Assisted Airless
- Fluid pressure 300 - 1500 psi
- Air used to shape spray pattern

Airless
- Fluid Pressure 1000 - 4000 psi

Centrifugal Atomization

Centrifugal force used to evenly distribute coating
- Coating sheared off of edge of disk platter or bell cup

Automatic versions available

TurboDisk
- Applicator mounted on vertical reciprocator
- Used for high volume coating

Rotary Atomizer
- Stationary, machine or robot mounted
- Quick color change capability, highly adaptable

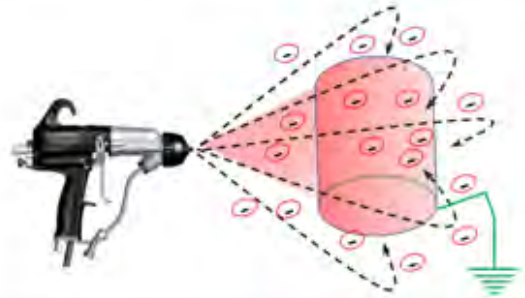
Electrostatics

Electrostatic charge is used to drastically increase transfer efficiency. More of the coating sprayed goes on the part.

Negative electrostatic charge is applied to the coating material as it is being atomized. Product is at ground potential creating attraction.

Manual and automatic versions available
- Can be applied to all atomization technology

Atomization Technology	% Transfer Efficiency							
	25	35	45	55	65	75	85	95
Conv.	■	■						
HVLP		■	■	■				
LVMP		■	■	■				
Airless			■	■	■			
AA Airless			■	■	■	■		
Conv. E-stat				■	■	■	■	
Rotary E-stat					■	■	■	■
Turbodisk E-stat						■	■	■



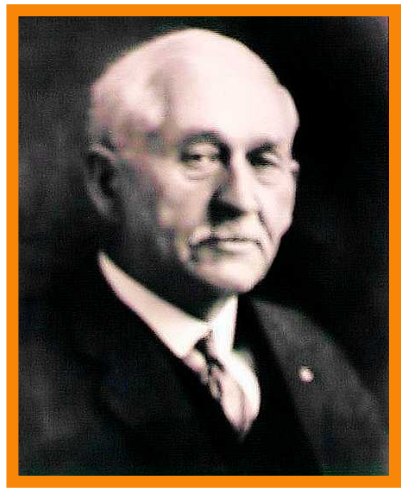
What is Atomization?

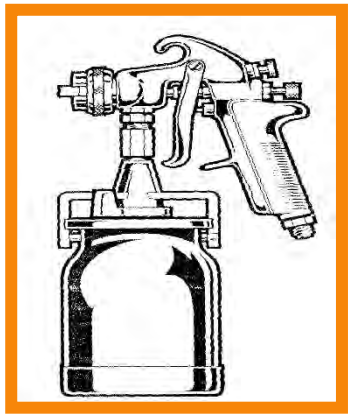
Atomization Defined

- To reduce to or separate into atoms; pulverize
- To reduce to a spray
- The reduction of fluids into fine spray through the addition of external force

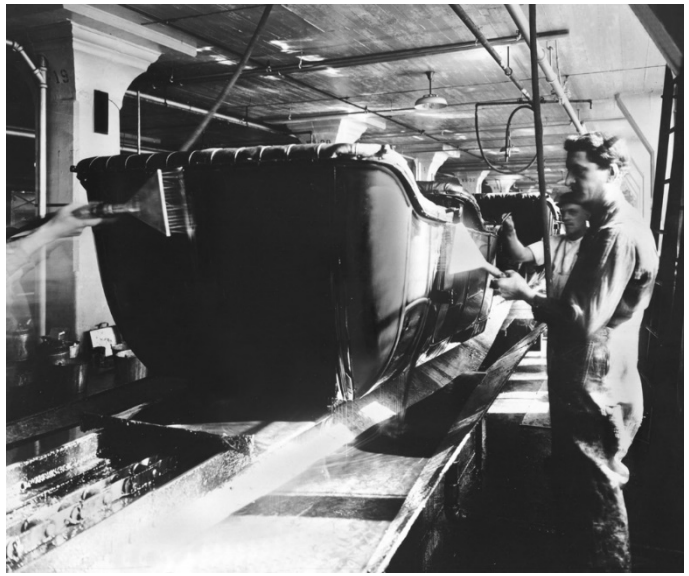
Atomization History

- First Atomizers
  - Developed by Dr. Allen DeVilbiss in the late 1800’s
  - He was looking for a better method of applying medicine to patient's throats
- Developed Bulb Atomizer
  - Introduced the first method of atomization which was later defined as Air Spray
  - Uses atmospheric pressure and venturi effect
  - This then evolved into the modern spray gun used with compressed air for industrial spray





Atomization History



Brushed with Shellac Paints

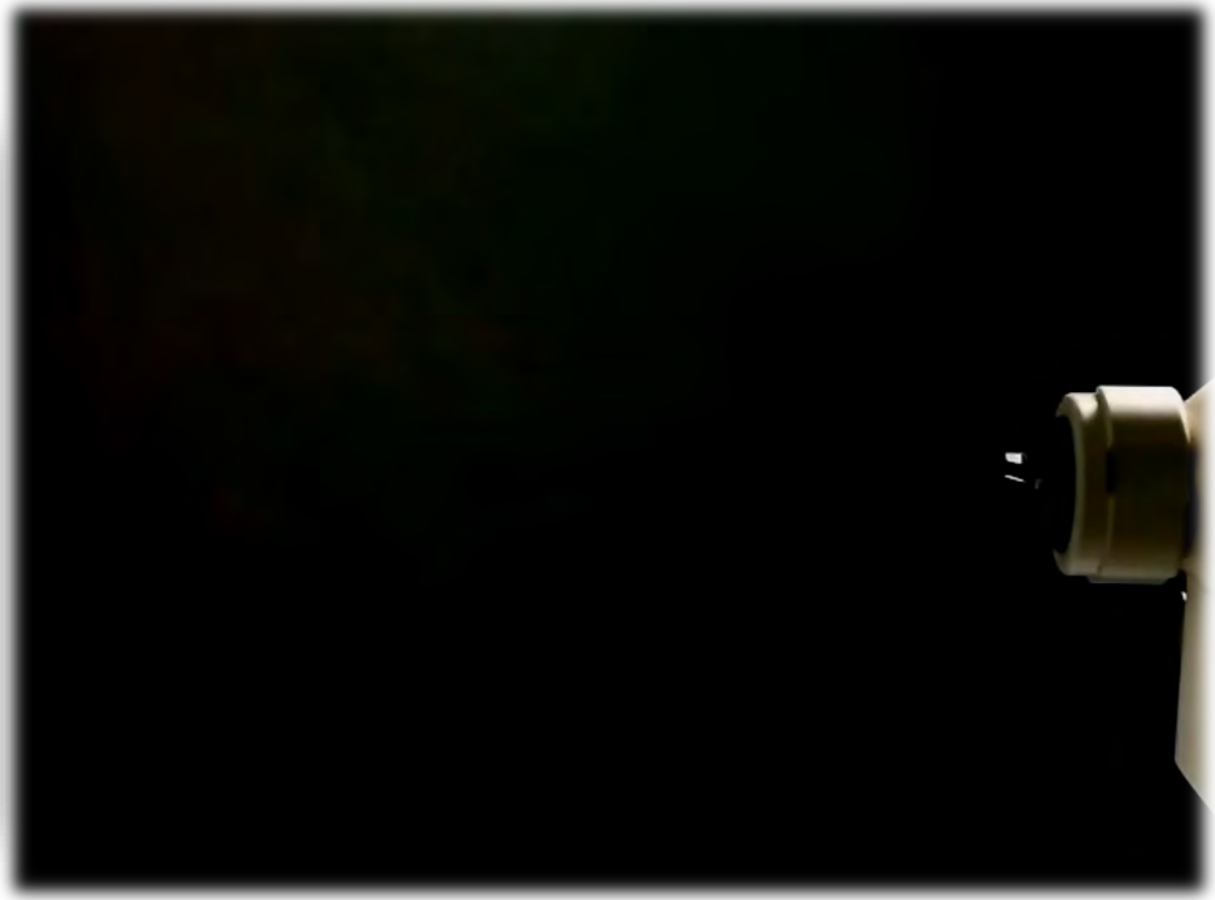
As High as a 1 Month Process

1000% ↑
Production Speed

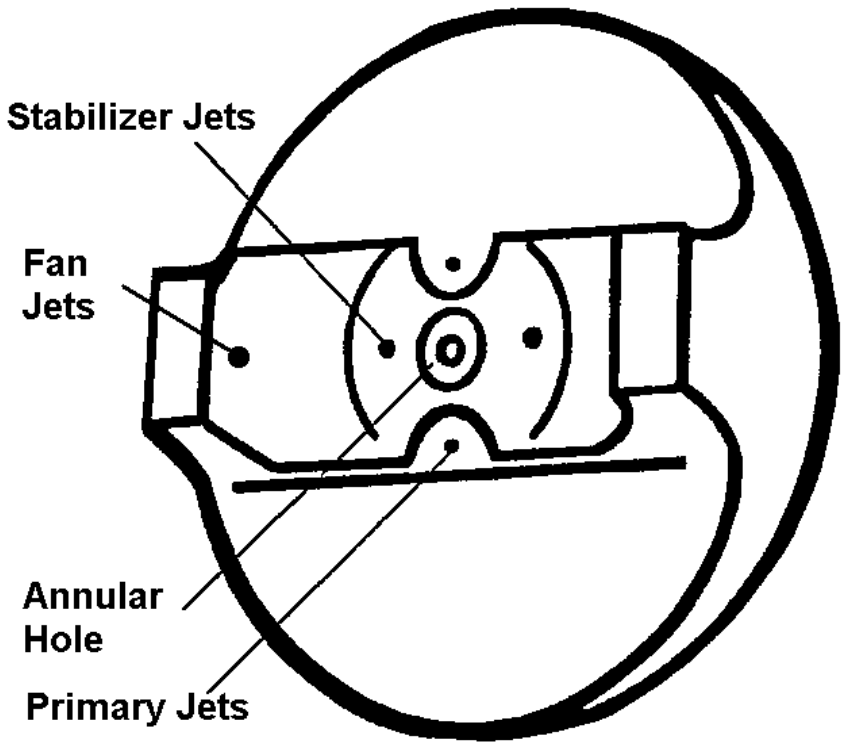
Atomized with Lacquer Paints

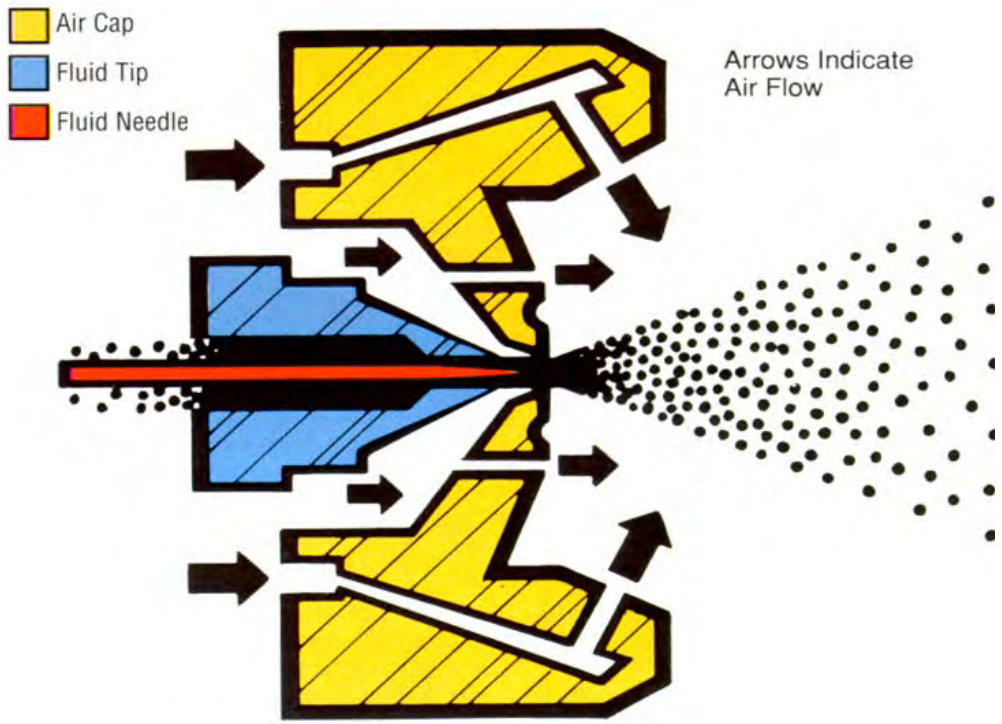
2/3 Day Process

Air Atomization



Air Atomization





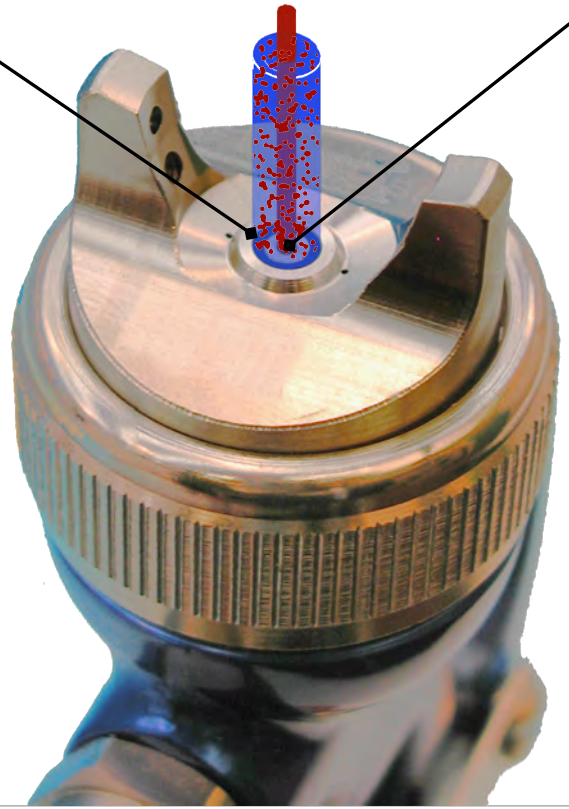
How Air Atomization Works

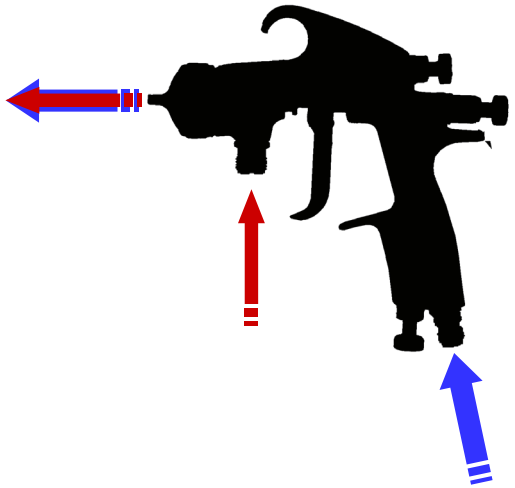
Speed Difference between Air and Fluid Jets creates Atomization

Annular Orifice = Atomizing Air

Fluid Tip Center Hole = Fluid Stream

The holes on all air caps are designed to carry out several functions during spraying





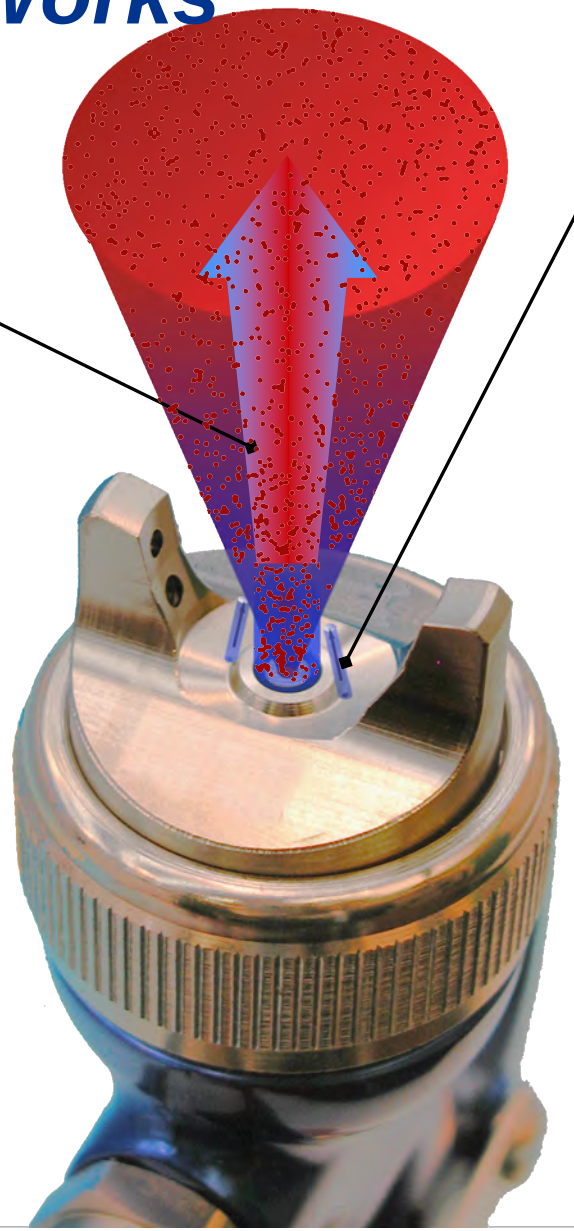
How Air Atomization Works

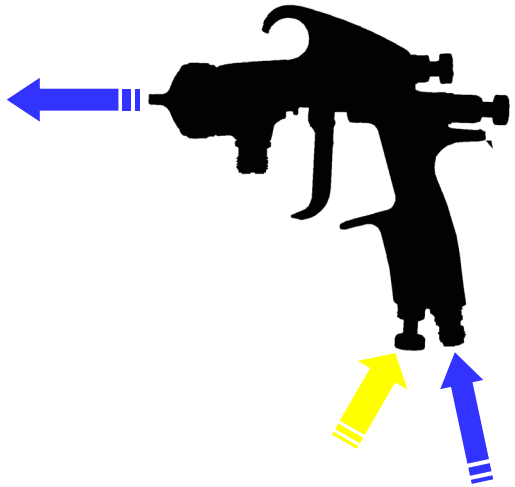
Face Holes = Stabilization & Cleaning

Natural Divergence of the Air Stream creates a conical round spray pattern

The quantity of air emerging from the Air Cap holes are controlled primarily by the pressure on the main supply regulator and sometimes by a control valve located on the gun handle

The center atomization annulus and the Face holes are fed from the same air supply passageways in the gun head

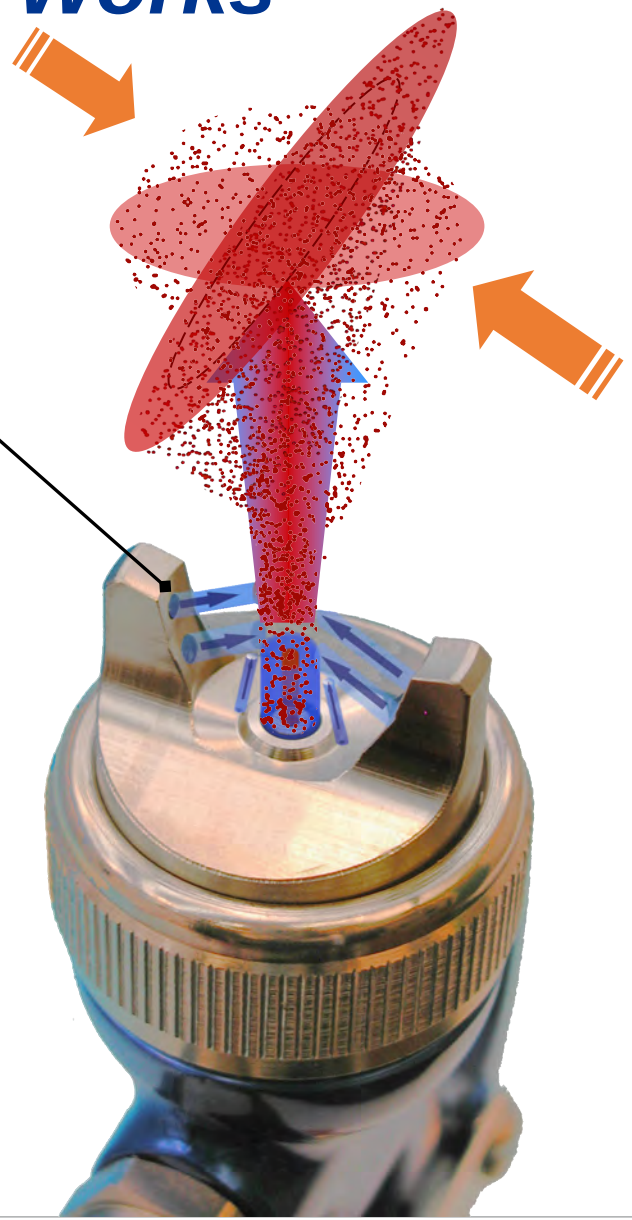




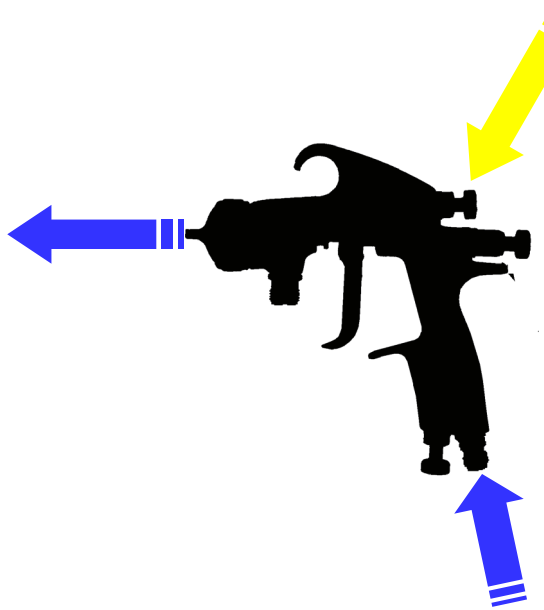
How Air Atomization Works

The Pressure of the Horn Air Jets on both sides of the cone creates the spray pattern

The Round spray pattern needs to be ‘squeezed’ into a longer spray pattern if it is to be more useful for spray finishing of large surfaces.



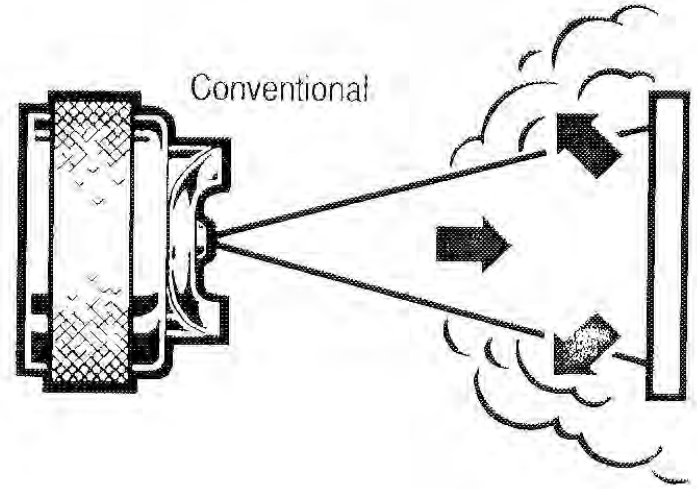
The amount of air pressure on the sides of the cone are controlled by the ‘Spreader Control Valve’ located at the top rear of the gun

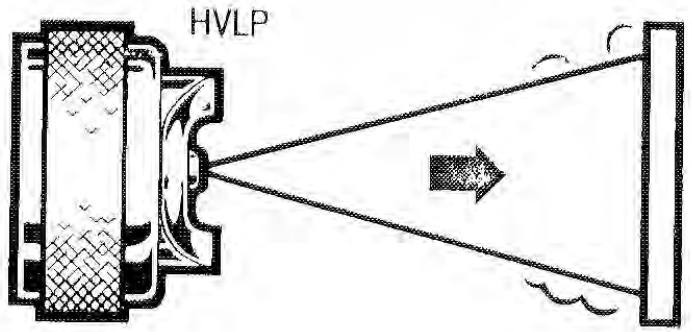


Air Atomization

- ***The Era of Conventional Spray***
  - Initial standard that all air atomizers were held too was finish quality
  - Also known as High Volume High Pressure
  - High Particle Velocity, 100-300 ft./sec
  - Great Finish Quality
  - Not great Transfer Efficiency

- ***Along came rule 1151 from the SCAQMD and HVLP takes reign***
  - Low Pressure
  - High Volume
  - Less Bounce-Back
  - Less Overspray
  - Okay Finish Quality
  - Better Transfer Efficiency

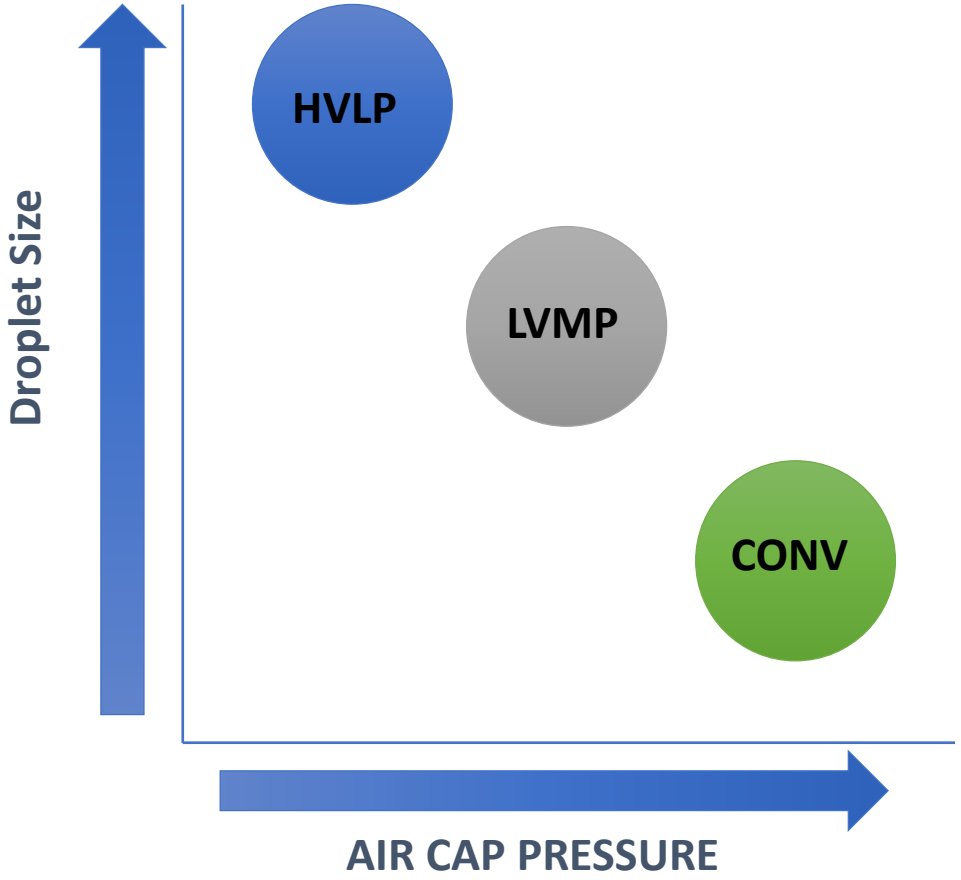




Air Atomization

Air Spray Technology	Terminology	Air Cap Pressure Range
Conventional Spray	HVHP	40 – 100 psi
High Volume Low Pressure	HVLP	Up to 10 psi
Trans-Tech/High Efficiency	LVMP	15 to 35 psi

Air Atomization



Technology	Finish Quality	Transfer Efficiency	Air Consumption
CONVENTIONAL	++	-	-
LVMP	+	++	+
HVLP	-	+	-

"++" = Best, "+" = Better, "-" = Good

Popular Air Atomization Manual Gun Offerings

Trophy Gun Models

Gun Model	Available Feed Options	Available Atomization Technologies
Trophy	Gravity, Suction, Pressure	Conv., HVLP, LVMP
TEKNA ProLite	Gravity, Pressure	HVLP, LVMP
Model 2100	Suction, Pressure	Conv.

Automatic Atomizers will be discussed in later webinar

TEKNA Prolite Models

Model 2100 Gun

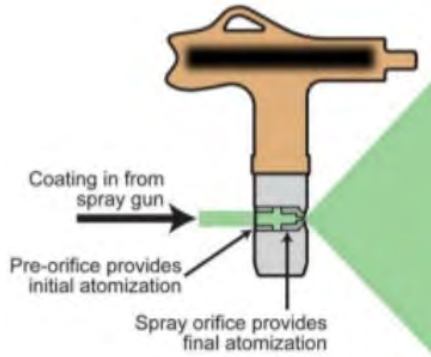
Hydraulic Atomization

Hydraulic Atomization

- Coating is forced through a fixed orifice atomized by shear with the rapid change in pressure
- Pattern size is dependent on the angle machined into the fluid tip
- Flow rate is governed by fluid pressure & tip orifice size
- Two Common Manual Gun Technologies:
  - Airless
  - Air-Assisted Airless

Hydraulic Atomization

- **Airless**
  - Typical fluid pressures range between 1000-7500psi
  - High flow capability
  - Very versatile in coating applications
  - Quick film build applications
  - Minimal wearable parts for long life with aggressive material applications



Hydraulic Atomization

- **Air-Assisted Airless (AAA)**
  - Typical fluid pressures around 300 to 4000psi
  - Similar atomization process as airless
  - Air is added for slight atomization improvement but mainly for pattern control and uniformity

Airless & Air-Assisted Airless Offering

MX HD Pump Packages

Model 75 Airless Gun

Carbide Airless Twist-Tips

Trophy AA 16000/4400 Flat Tip Model

Trophy AA 16000/4400 Twist Tip Model

RS Series Flat Tips

MX Lite Pump Packages

MX MD Pump Packages

Transfer Efficiency

Transfer Efficiency

- According to the American Society for Testing and Materials (ASTM)
  - *"The ratio of the weight of paint solids deposited to the weight of the paint solids sprayed, expressed as a percent".*

- ASTM D5286-01 Determination of TE Under General Production Conditions
- ASTM D5009-02 Evaluating and Comparing TE Under Laboratory Conditions
- ASTM D5066-91 Determination of TE Under Production Conditions (Automotive Paints)
- ASTM D5327-97 Evaluating and Comparing TE Under General Lab Conditions

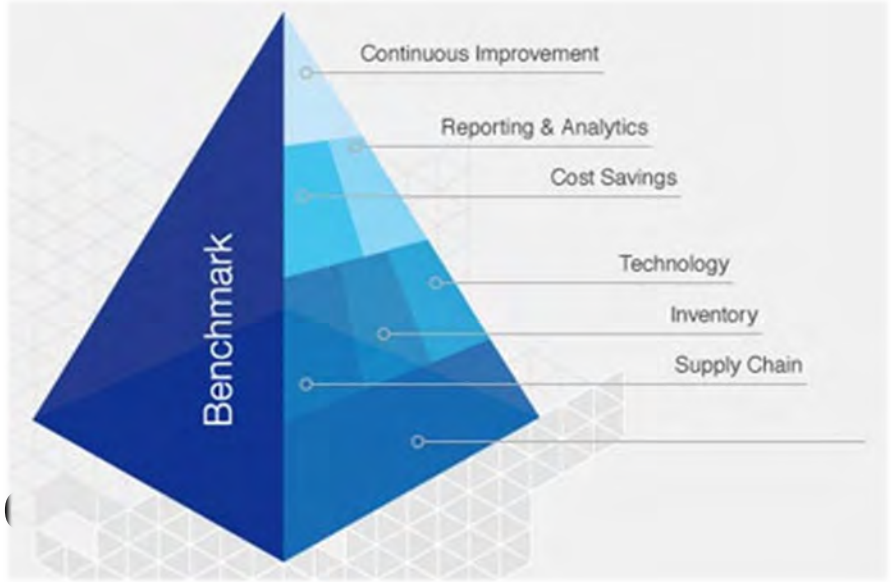
Transfer Efficiency

- A measurement of how much coating is actually applied to the substrate compared to what was sprayed (how “efficiently” is it “transferred”)

Transfer Efficiency

Why is TE important to Measure?

- Helps benchmark a system
- Helps improve processes
- Helps understand coating cost per part
- Helps reduce material usage
- Helps determine environmental complian

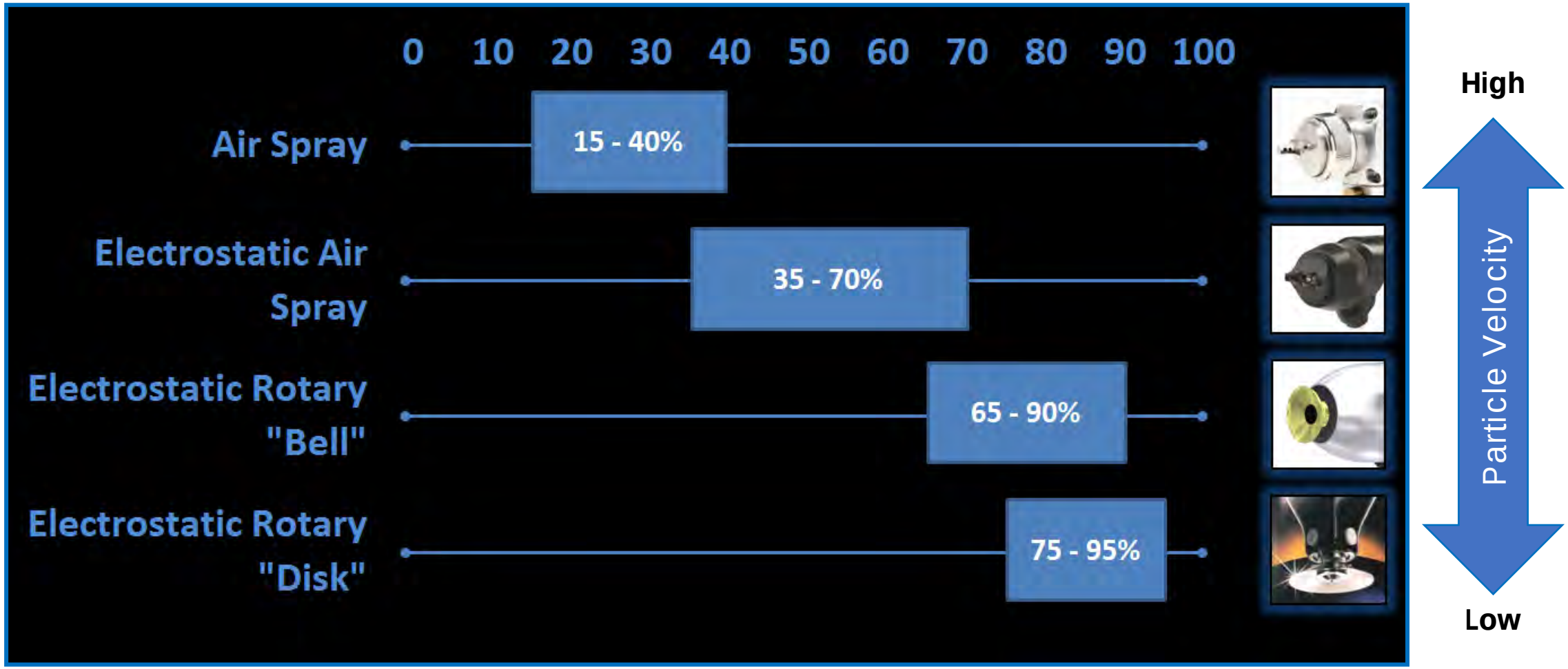


Transfer Efficiency

- You pay for paint 4 times!
  - You pay somebody to buy it
  - You pay somebody to apply it
  - You pay somebody to clean it up
  - You pay somebody to dispose of it

<u>The best way to reduce coating usage is to minimize the volume of material that is sprayed.</u>

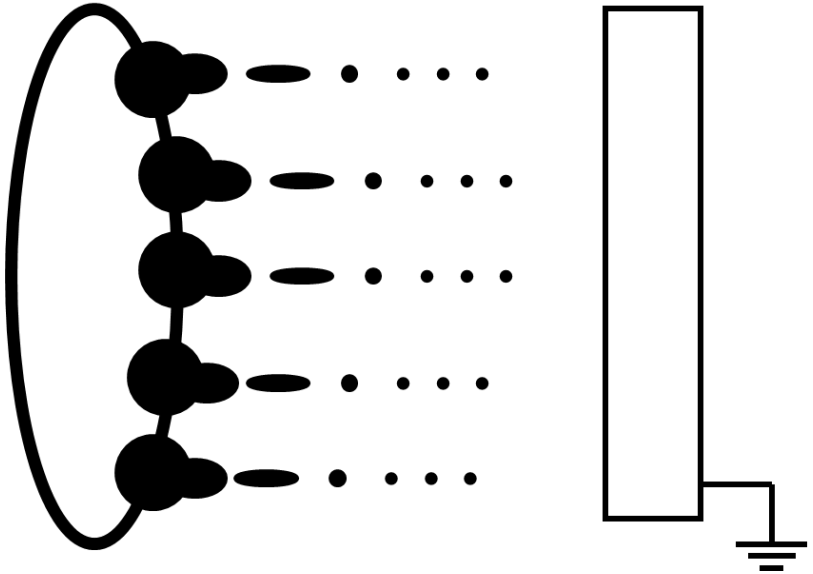
Atomization Types & Transfer Efficiency



Electrostatic Atomization

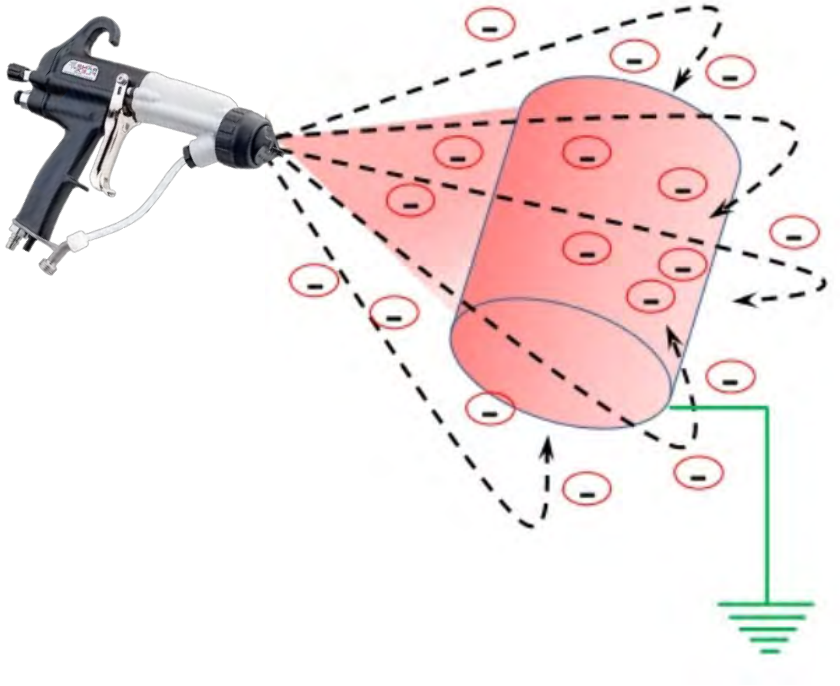
Electrostatic Atomization

- **The No.2 Process Gun**
  - Only current spray applicator that uses pure electrostatic atomization
  - Coating is pulled off the charged applicator onto the grounded part
  - The “bell” is driven by an electric motor at relatively low speeds (900-1200 rpm) to distribute coating evenly on perimeter’s surface

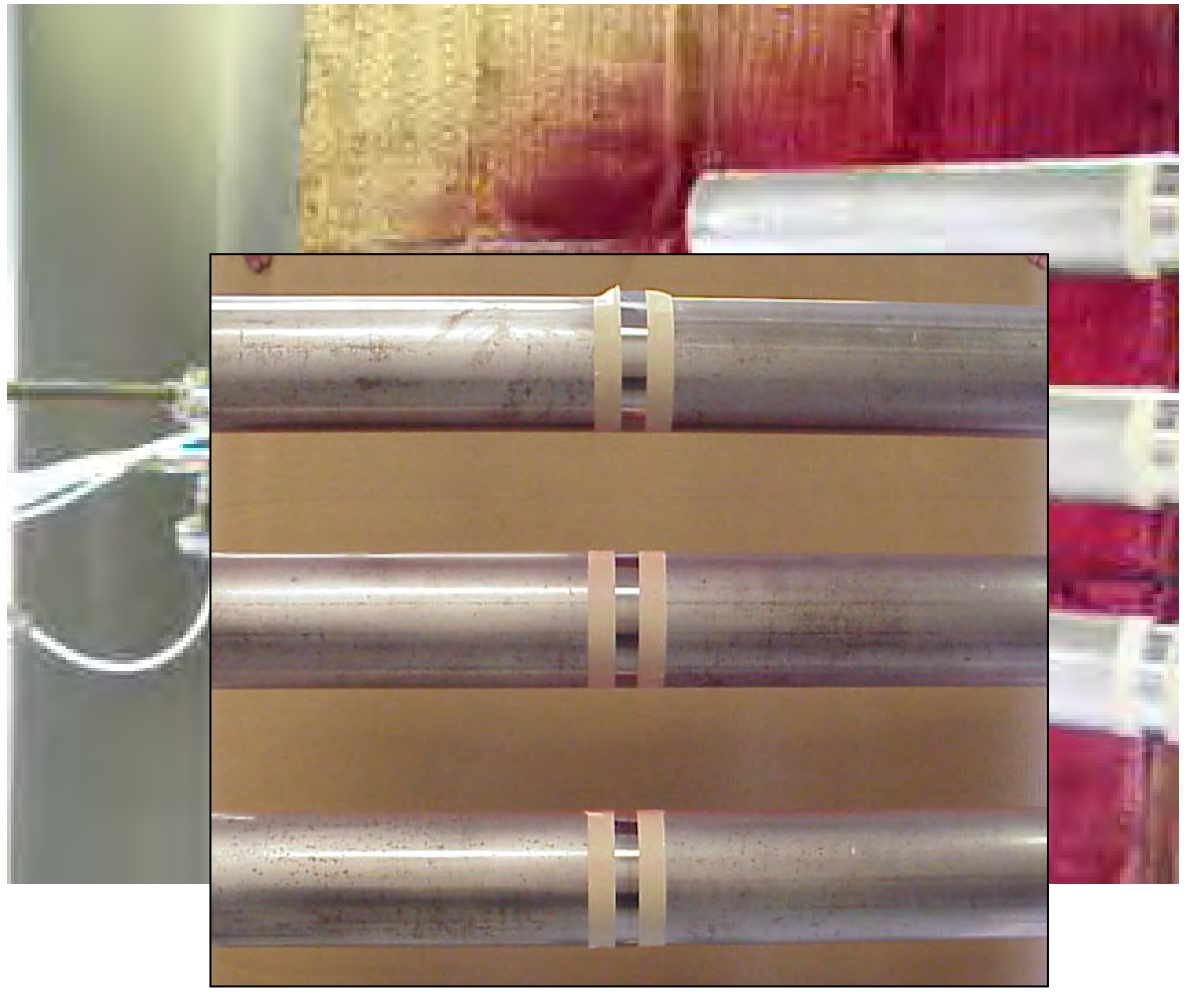


Electrostatics

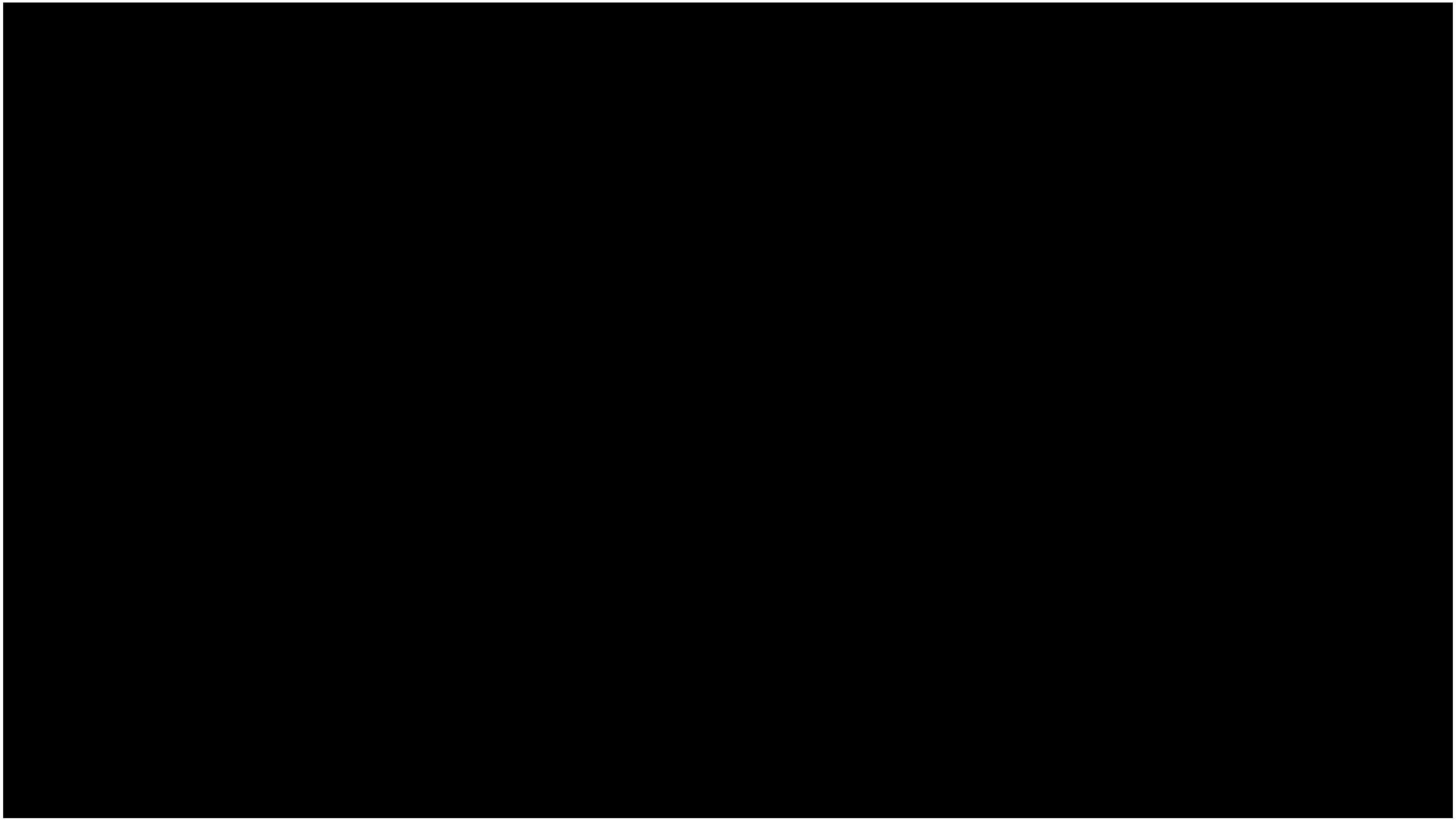
- Electrostatics can be applied to the other forms of atomization to behave like the No. 2 Process
- This is done by applying the high potential charge to the coating just prior too or during it's atomization
- The coating is negatively charged as it atomized leaving the applicator (Up to 100kV)
- Product or substrate is maintained at ground potential
- The charged atomized droplets are attracted to the grounded parts increasing T.E.



Electrostatics



RansFlex Turbine Driven



Electrostatic Manual Gun Offering – RansFlex

Solvent Based Materials

Direct Charge

RansFlex RX – 45kV

RansFlex RFX – 65kV

RansFlex RXQ – 45kV

RansFlex RFXQ – 65kV

Waterbourne Materials

Indirect Charge

RansFlex RFXi – 65kV

Waterbourne Materials

Direct Charge

RansFlex RFXW – 65kV

Typical Markets/Substrates

Applicator technologies can be used across a wide range of markets and applications

Metal

- Urethanes
- Acrylics
- Multi-Component
- Epoxies

Wood

- Toners
- Stains
- NGR Stains
- Topcoats
- UV Materials

Transportation

- Primers
- Base Coats
- Clear Coats
- Aerospace specific coatings

Special Coatings

- Waterborne
- Adhesives
- Mold release
- Ceramics
- Enamels

The Brands You Trust

BGK™ products deliver precision-engineered curing capabilities for a full range of coatings including liquid, powder, wax, UV and adhesives.

Binks® products boast innovative spray gun and air cap design along with industry leading pumps and controls.

DeVilbiss® products include low pressure manual and automatic spray guns and related spraying accessories. *DeVilbiss* products are widely acclaimed for ergonomics and innovative spray gun design.

Hosco® products deliver smooth bore, “cavity free” stainless steel fittings and accessories designed for use in paint circulating and application finishing systems.

ms® products include powder coating systems and equipment. ms is recognized throughout the world for quality, efficiency and durability.

Ransburg® manual and automatic electrostatic finishing products offer spray finishing solutions to industrial and automobile manufacturing markets.

Thank you!

FINISHING EDUCATION UNIVERSITY

Thank you!

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