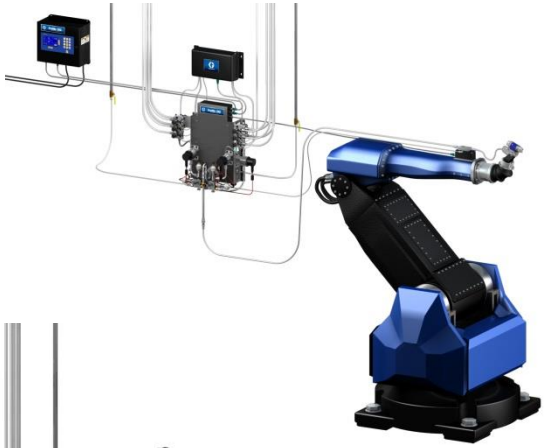
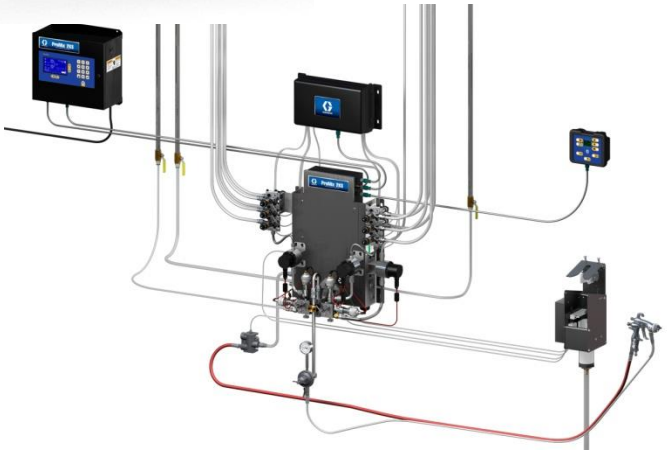
Handling 2 Component Paint
Or Why 2K?





Agenda

- Reasons for 2K Material Use
- Challenges using 2K
- Methods for mixing two component materials
- Components of an electronic mixing system
- Cost Comparison of mixing processes
- Questions

Manufacturing a Painted Part

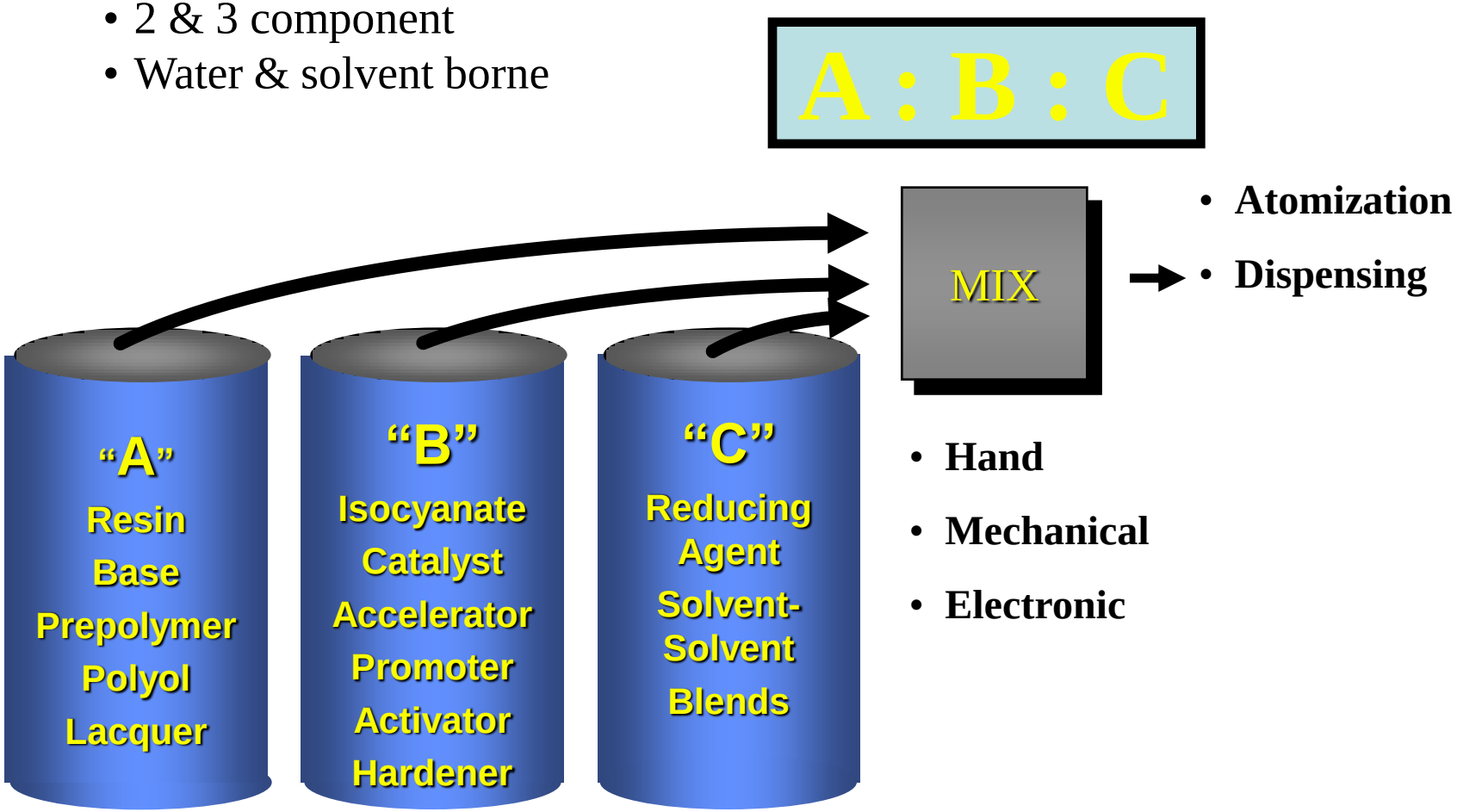
- What are we trying to accomplish?
  - Deliver a part for its intended use that
    - Meets appearance requirements
    - Is protected from outside environments
    - Meets cost objectives
    - Complies with local, state, and/or federal regulations
      - Worker Safety
      - Air Quality
      - Water Quality
      - Hazardous Waste Disposal
      - Non-hazardous waste disposal

Plural Component Material Benefits

- Improved durability
  - Withstand abusive conditions better than other paints
- Better chemical resistance
  - Withstand chemical exposure better than other paints
- Increased flexibility
  - Less likely to crack on plastic substrates when impacted (polyurethane's)
- Lower energy cure
  - Ovens can be run at lower temperatures
- Faster cure times
- Lower VOC’s

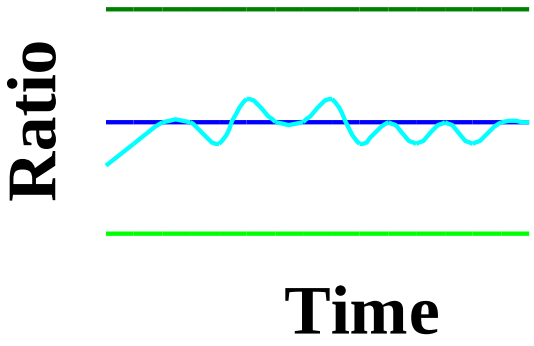
2 and 3 Component Breakdown

- **More difficult to mix material formulations:**
  - 2 & 3 component
  - Water & solvent borne

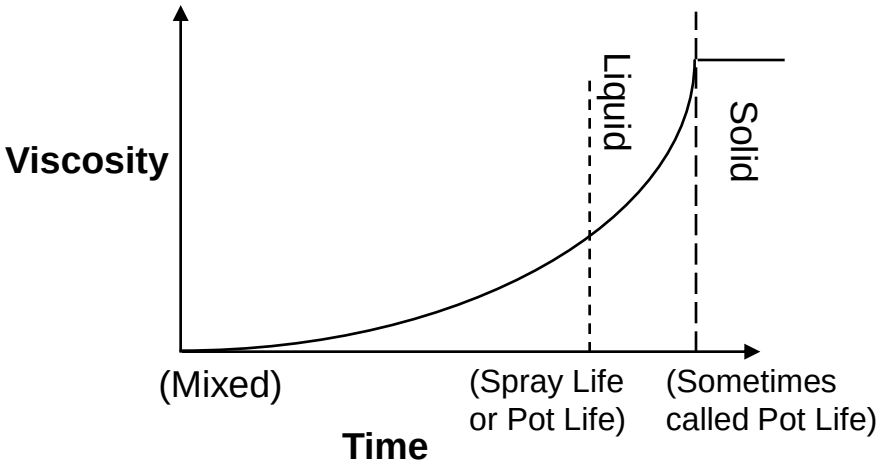


Plural Component Material Challenges

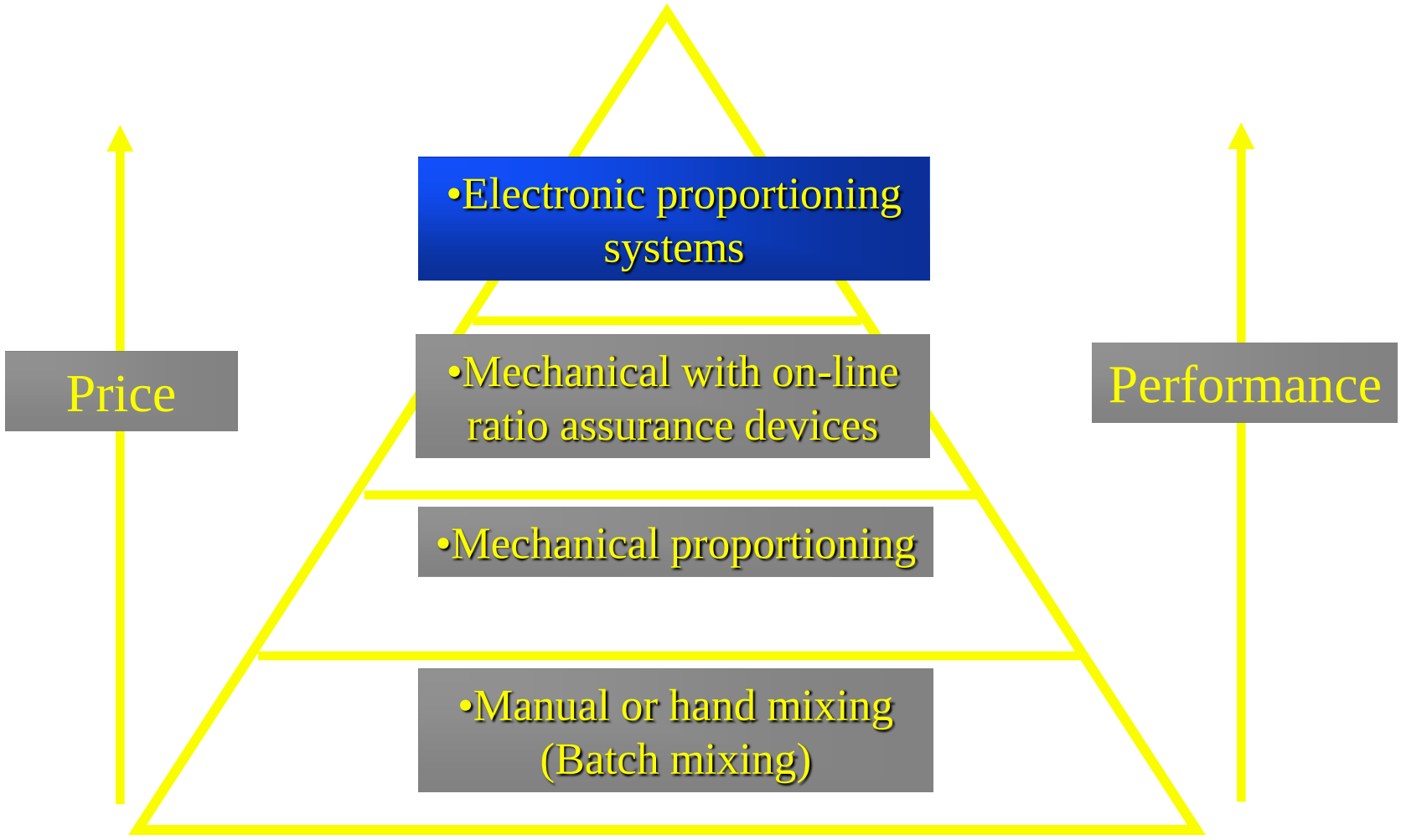
- Maintaining proper ratio
  - Off-ratio blending results in costly failures for manufacturers:
    - Lost Production
    - Rework
    - Scrap
    - Warranty



- Application prior to curing (spray life)
  - Cured material prior to spraying leads to costs:
    - Wasted material
    - Equipment damage
    - Lost time to clean up



Handling Plural Component



Mixing Issues with 2K

Problem

1. Not all material is used when pot life expires
2. Mix ratio not accurate enough
3. Don’t know when you are off ratio
4. Cured paint in system

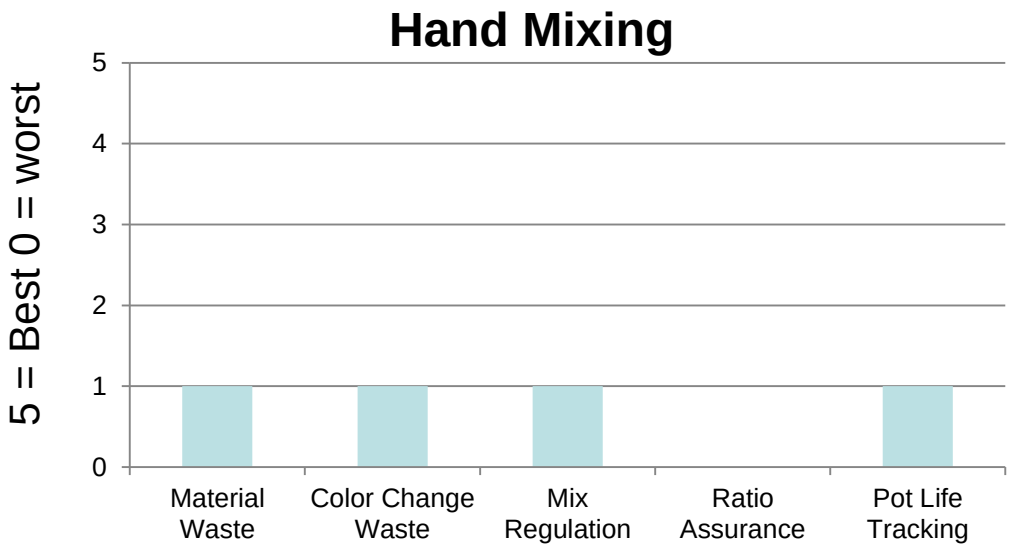
Solution

1. Limit amount of mixed material in the system
2. Mechanical or Electronic mix regulation
3. Monitor mix ratio and shut down when off
4. Manage pot life with timers

Manual or Hand Mixing

- Why manual or hand mixing?
  - Not capital $ intensive
  - Some materials ratios are not that critical
  - Low production volumes & rates
- What are the issues with hand mixing?
  - Disposal of cans
  - Large quantities of clean-up solvent
  - Labor intensive
  - “Quality of life” for employees
  - Operator related measuring & mixing quality issues
  - Wasted Material

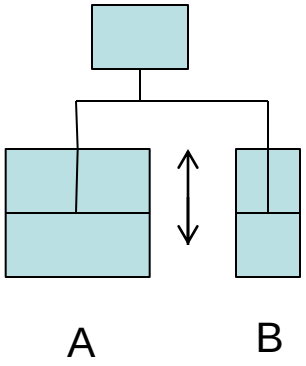
Hand Mix Grading



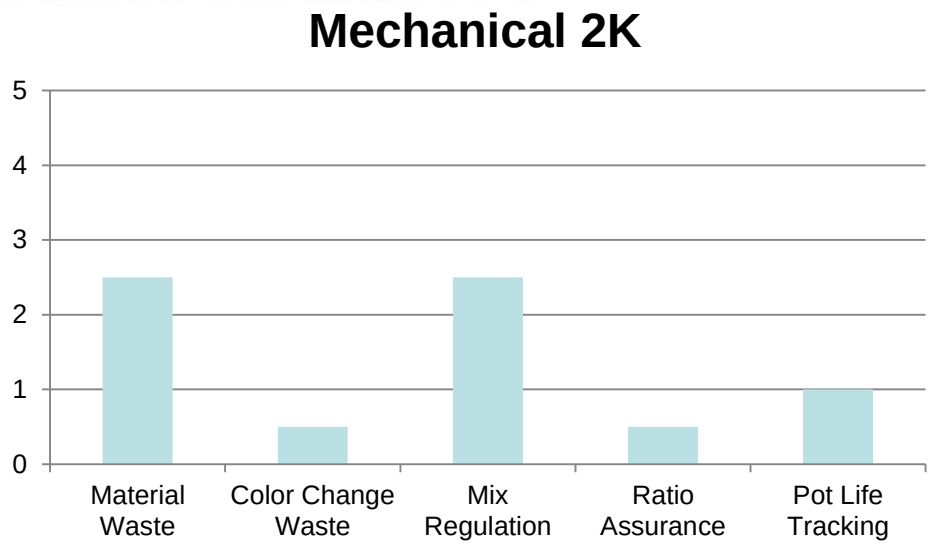
1. Wasted Material
   - Whatever is not sprayed after material becomes too thick
2. Ratio Accuracy
   - Limited to operators ability
3. Ratio Assurance
   - None, find bad parts when they don't cure
4. Pot Life Tracking
   - Evident when paint is harder to spray

Mechanical Proportioning Overview

- Limits Mixed material by mixing 2K on demand
  - Only in feed hose
- Regulates ratio by fixing volume flow of A and B
  - Uses common pump air motor to drive two lowers
  - Lower size difference determines fixed mix ratio
- Mostly no off ratio alerts
  - Enhanced systems have pressure sensors to detect leaking => off ratio
- No pot life time tracking



Mechanical 2K Grading



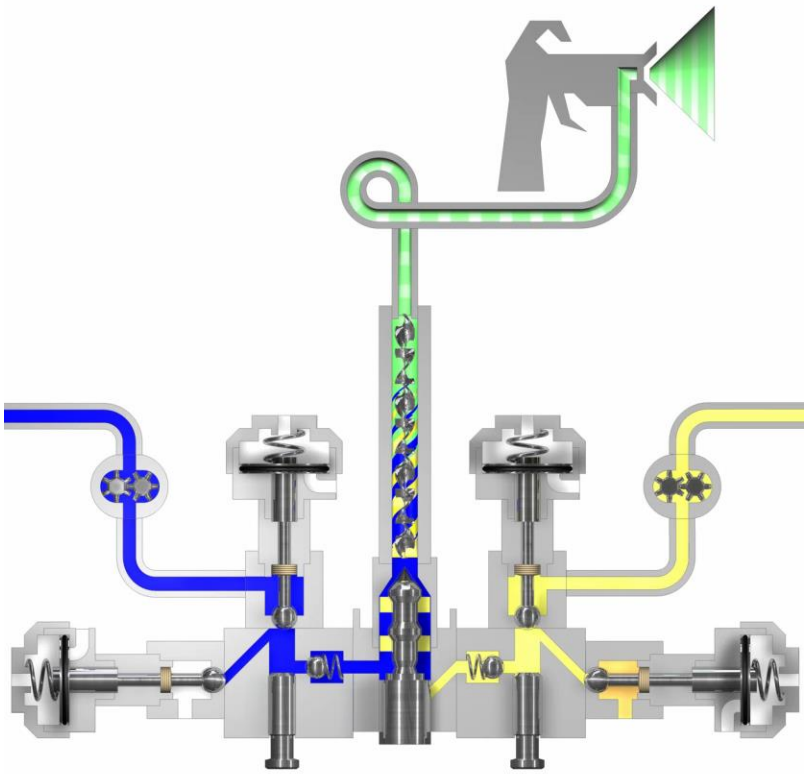
1. Wasted Material
   - Limited to what is in the line but is difficult to flush at color change
2. Ratio Accuracy
   - Better but limited to accuracy at pump change over
3. Ratio Assurance
   - Limited, may have pressure balance regulation
4. Pot Life Tracking
   - None, evident when material is too thick to spray

2K Mixing - Electronic Controlled

- Medium Quantity
  - Entry level electronic 2K proportioning
    - Single color/Catalyst
- Higher Quantity
  - Advanced Level Proportioning
    - Multiple Colors/Catalysts
    - Automation
    - Flow Control
    - Reducing on demand

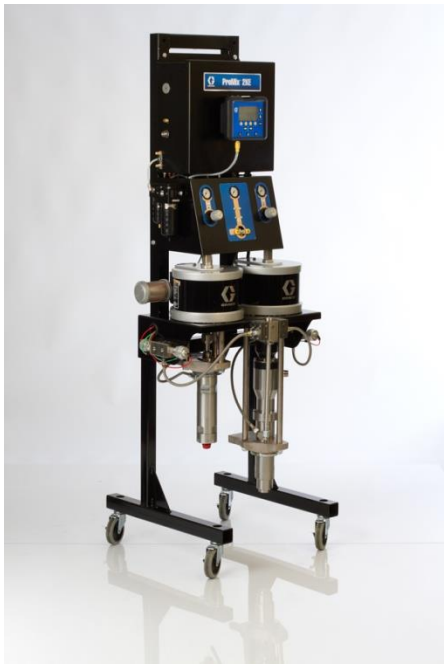
Graco Sequential Dosing

- All Dosing is done by volume only
- Process for 2:1 mix ratio with 50 cc Integrator → 34cc Resin, 17cc Catalyst
  - The A side dispense valve is opened
  - The system counts 285 pulses from the A meter (34cc/0.119cc/pulse)
  - The A side valve is closed
  - The B side valve is opened
  - The system counts 142 pulses from B meter (17cc/.119cc/pulse)
  - The system closes the B valve
  - Repeats
- Accuracy of the mix ratio is dependent on the accuracy and calibration of the K factor for each meter



ProMix 2KE Platform

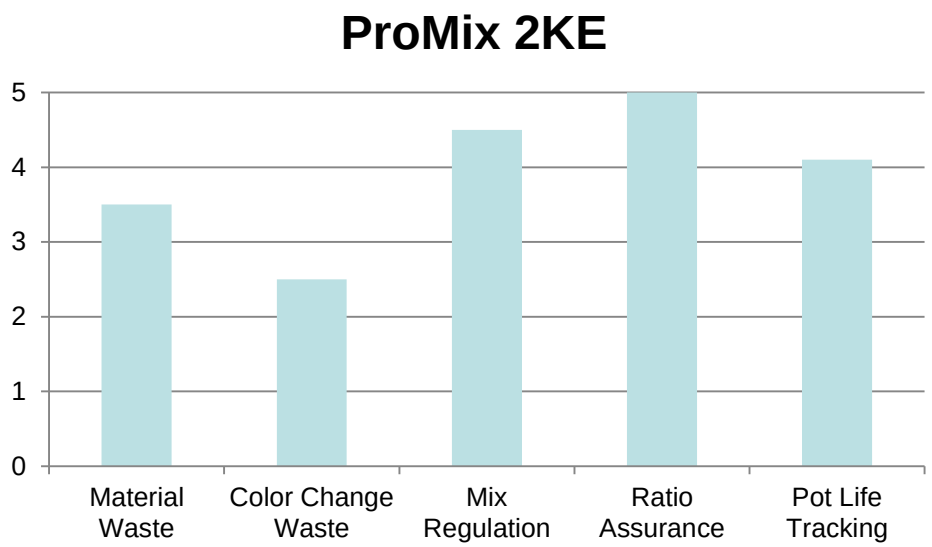
ProMix 2KE entry level electronic proportioner. This is the latest line from Graco designed to make the job of mixing 2K paints easy and reliable



Highlights

- Compact size
- Flexible and easy installation
- Meter based systems that can offer up to 3 colors
- Pump based systems that have configurations in all spray technologies
- Proven reliability of Graco proportioning technology

ProMix 2KE Grading



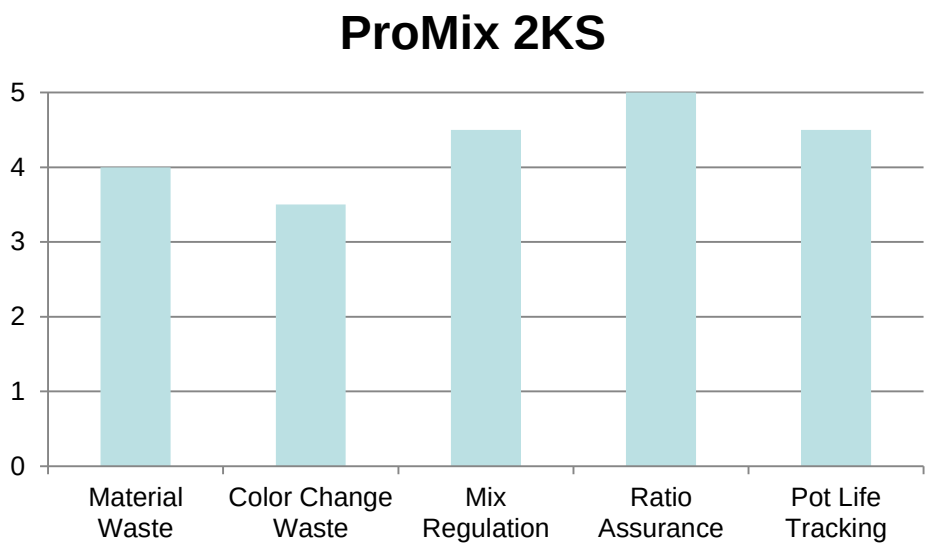
1. Wasted Material
   - Flush material in line with solvent, improved Color Change time and waste.
2. Ratio Accuracy
   - Excellent, within 1%, user settable tolerance
3. Ratio Assurance
   - Excellent, Shuts down when not meeting ratio tolerance
4. Pot Life Tracking
   - One or 2 guns but one gun if GFB is installed

ProMix 2KS Performance

ProMix 2KS is designed for high performance. With its precision mix ratio capability, 2KS produces high quality results while adding protection from off ratio conditions.

- Precision sequential dosing for most fluid applications
  - 0.1:1 - 50:1 mix ratio to within ± 1% accuracy
- Optional dynamic dosing for mixing waterborne urethane materials
  - 0.1:1 - 30:1 mix ratio to within ± 1% accuracy
- Flow Range 20 - 3800 cc/min
- 30 Color/ 4 Catalyst Capability

ProMix 2KS Grading



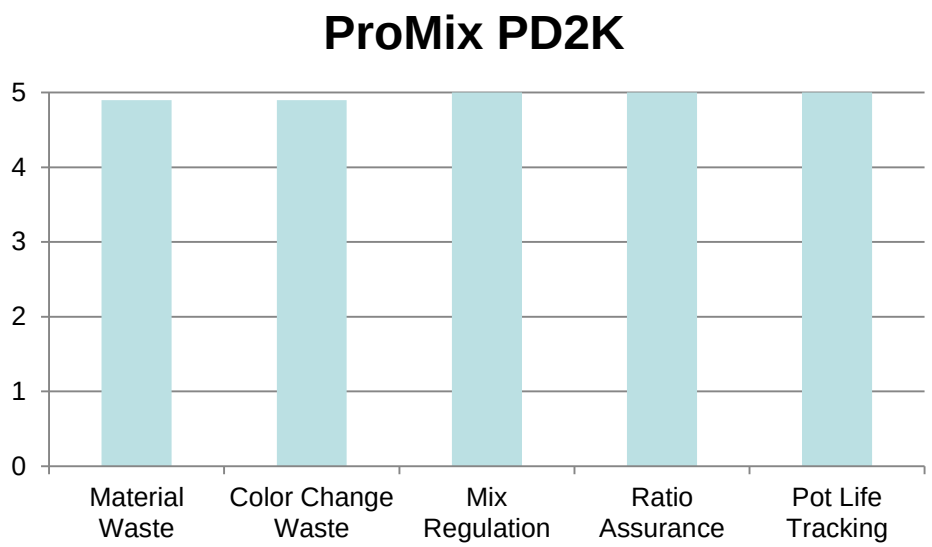
1. Wasted Material
   - Flush material in line with solvent and air also improves Color Change time and waste.
2. Ratio Accuracy
   - Excellent, within 1%, user settable tolerance
3. Ratio Assurance
   - Excellent, Shuts down when not meeting ratio tolerance
4. Pot Life Tracking
   - 1-2 guns and 1-2 GFBs, tracks each line independently

Why ProMix PD2K

ProMix PD2K offers a number of advantages including:

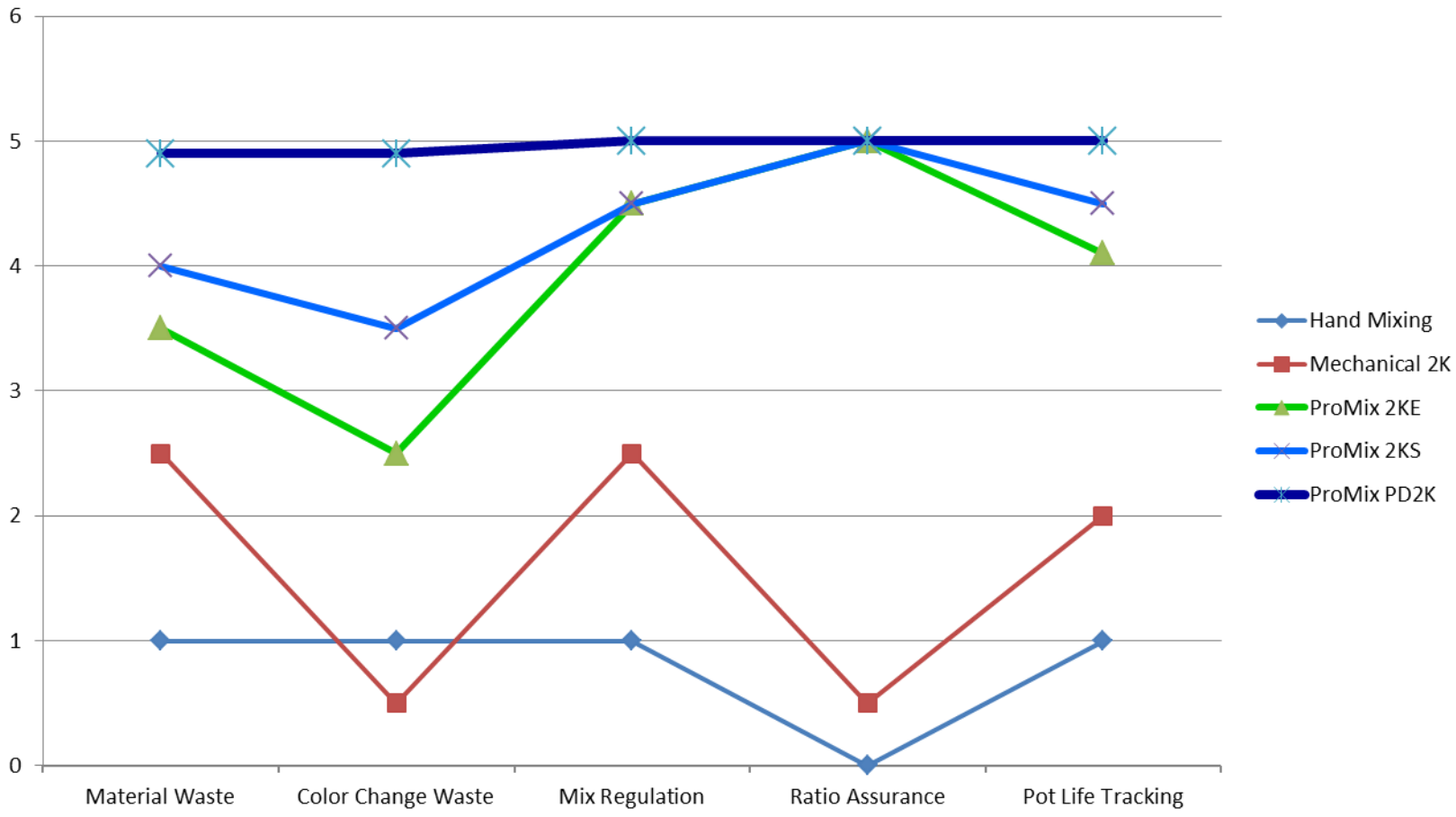
- Mixes 2K “at the belt” to reduce material waste in flushing
- Potential 80% reduction in solvent use and mixed material waste
  - Lower disposal costs of hazardous waste materials
  - Short color change time adds flexibility
- Maintains optimal transfer efficiency with integrated fluid pressure management saving valuable material

ProMix 2KS Grading



1. Wasted Material
   - Best, limited mixed material to 3-6 ft from gun maximizes efficiency in flushing and color change.
2. Ratio Accuracy
   - Best, always within 1%,
3. Ratio Assurance
   - Excellent, Shuts down when not meeting ratio tolerance
4. Pot Life Tracking
   - Best, short material line leads to always fresh material

System Grade Summary



Example of 2K Material Use

- Manufacturer uses 5 colors per shift
- 2 shifts per day open 250 days per year
- Hand mix 8 batches, 5 gallons each per shift
- Paint is $50 per gallon with 1 hour pot life
- Solvent is $6.00 per gallon
- Disposal is $550 per drum = $10/gallon
- Labor rate is $20/hr with benefits

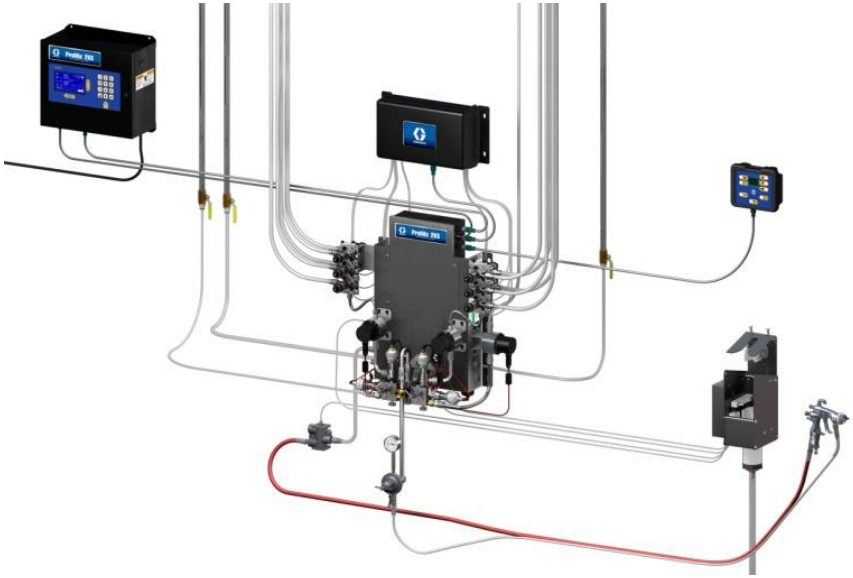
- Observations
  - They use 20,000 gallons of paint per year
  - They spend $1.0M on paint per year
  - Each batch takes 15 minutes to mix
  - There is about .5 gallons mixed paint in the hose and supply after 1 hour → wasted
  - Use about 1 gallon of solvent to clean up
  - Clean up takes 15 minutes

2K Analysis –Hand Mixing

Process	Per Batch	8 Batches per shift	2 Shifts Per Day	250 Days Per Year
15 Minutes of Mix time	= .25 Hr * $20/hr = $5.00	$40.00	$80.00	$20,000
.5 Gal Paint waste	= 0.5 gal * $50/gal = $25.00	$200.00	$400.00	$100,000
Solvent (1gal)	=1 gal * $6/gal = $6.00	$48.00	$96.00	$24,000
Disposal	= 1.5 gal * $10/gal = $15.00	$120.00	$240.00	$60,000
Clean Up	= .25 Hr * $20/hr = $5.00	$40.00	$80.00	$20,000
Total cost of process	**$56.00**	**$448.00**	**$896.00**	**$224,000**
Paint Waste	.5 Gal	4 gal	8 gal	2000 gal = 10% wasted paint
Barrels of waste	0.03 Bl	0.21 Bl	0.43 Bl	109 Bl

Electronic Proportioning

- Traditional electronic proportioning (25 ft feed line)
  - .2 gal mixed material in system
  - .3 gal to flush
  - .02 gal in pre mixed material in system
  - 1.5 minutes to flush

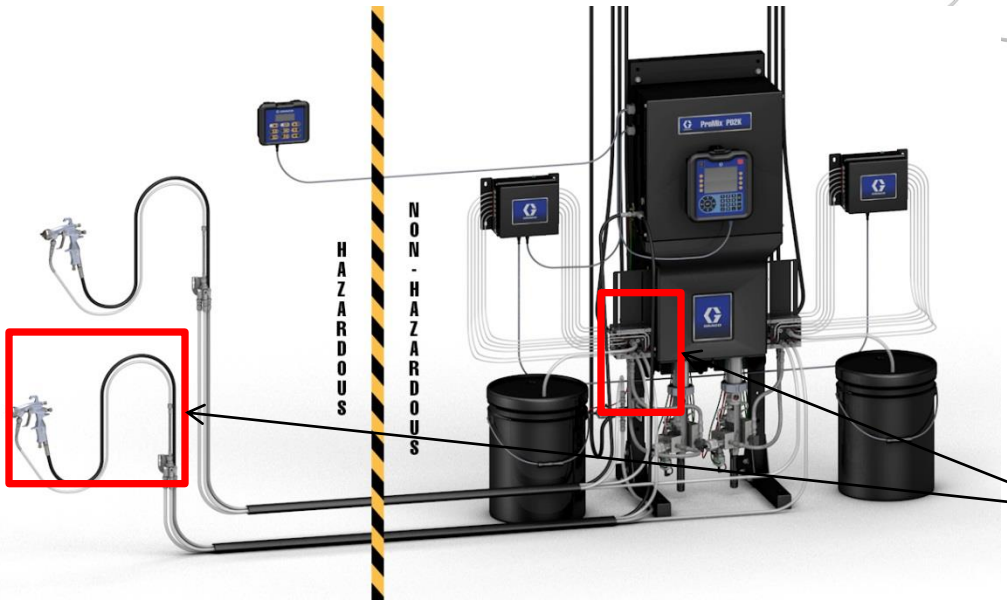


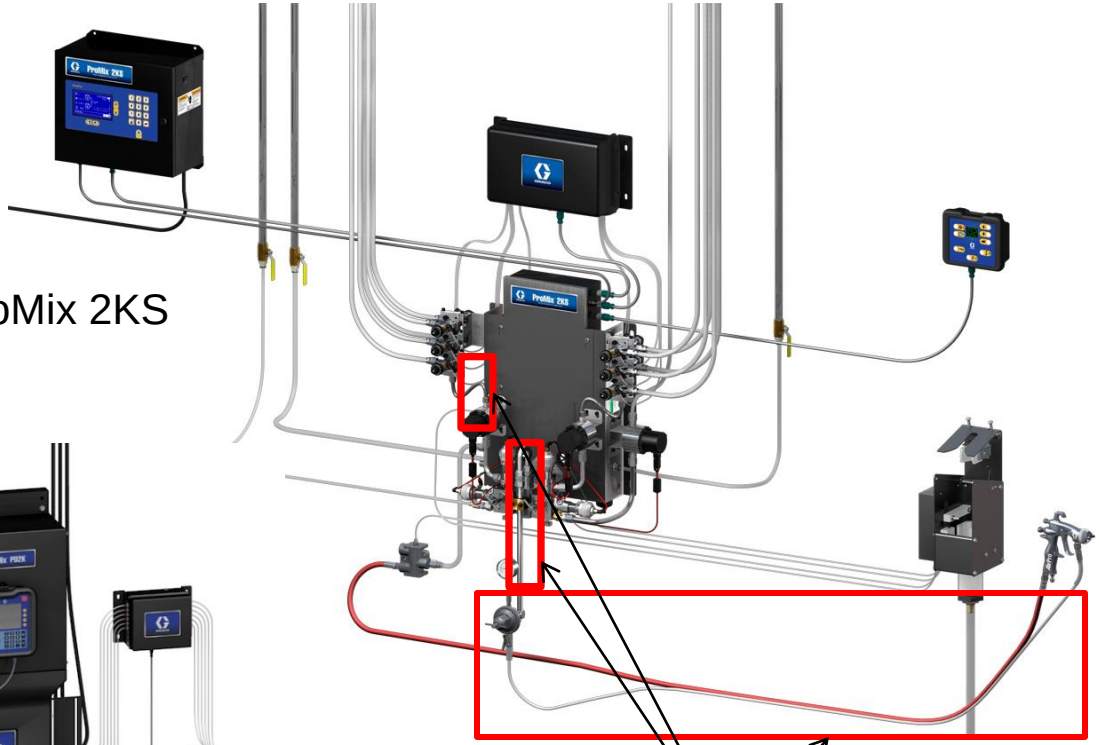
- Most efficient proportioning system
  - 60 cc or .016 gal mixed material in system
  - .016 gal to flush mixed material
  - .032 gal of premixed material
  - .055 gal to flush premixed material
  - 30 seconds to color change
  - 10 seconds to purge system

Flush Comparison

ProMix 2KS

ProMix PD2K





Flush Zones

System Comparison Summary

Annual Results	Hand Mix	Mechanical Proportioning	Electronic Proportioning	ProMix PD2K
Paint Waste (20,000 total gallons used)	2000 Gallons (10%)	950 Gallons (4.75%)	750 Gallons (3.75%)	280 Gallons (1.4%)
Cost of wasted paint	$100,000	$47,500	$37,500	$14,000
Solvent used	4,000 Gallons	8,850 Gallons	1,050 Gallons	194 Gallons
Disposal (55 gal barrels)	109 Barrels	161 Barrels	33 Barrels	6 Barrels
Total Cost	$224,000	$187,400	$63,550	$11,755
Savings over Hand Mix	---	$36,600	$160,450	$212,245
Savings over EP	---	--	---	$51,795

Graco ProMix Proportioning Systems

- ProMix 2KE
  - For entry level manual applications
- ProMix 2KS
  - Single or multiple gun systems, manual or automatic
- ProMix PD2K
  - Advanced system for peak performance and efficiency

- **Questions?**

Appendix

Electronic 2K analysis

Operation	Electronic Proportioning	ProMix PD2K
Color Change Paint	.22 gal * $50 = $11.00	.048 gal * $50 = $2.40
Solvent	.3 gal *$6 = $1.80	.071 gal * $6 = $0.43
Disposal	.52 gal * $10 = $5.20	.119 gal * $10 = $1.19
Labor	1.5 min* $20/hr = $0.50	.5 min * $20/hr = $0.17
Totals	$18.50 per color change	$4.19 per color change

Operation	Electronic Proportioning	ProMix PD2K
Purge Paint	.20 gal * $50 = $10.00	.016 gal * $50 = $0.80
Solvent	.3 gal *$6 = $1.80	.016 gal * $6 = $0.10
Disposal	.50 gal * $10 = $5.00	.032 gal * $10 = $0.32
Labor	1.5 min* $20/hr = $0.50	.17 mn * $20/hr =$0.06
Totals	$17.30 per purge	$1.28 per purge

Electronic 2K analysis

Process	Per Shift	Per Day	Per Year
2KS Color Changes	5 per shift *$18.50 = $92.50	$185.00	$46,250
2KS Purge	2 Per Shift * $17.30 = $34.60	$69.20	$17,300
Total Cost	$127.10	$254.20	$63,550
Paint Waste	1.5 gal	3 gal	750 gal = 3.75%
Waste Output	.07 Barrels	.13 Barrels	32.7 Barrels
ProMix PD2K Color Change	5 per shift *$4.19 = $20.95	$41.90	$10,475
PD2K Purge	2 Per Shift * $1.28 = $2.56	$5.12	$1,280
Total Cost	$23.51	$47.02	$11,755
Paint Waste	0.56 gal	1.12 gal	280 gal = 1.4%
Waste Output	.001 Barrels	.02 Barrels	6 Barrels

Mechanical Analysis

Normal Flush	Volume	Cost Per Flush	Vol Per Day	Cost Per Day	Vol Per Year	Cost Per Year
Material	0.2	$ 10.00	0.8	$ 40.00	200	$ 10,000.00
Solvent	0.4	$ 2.40	1.6	$ 9.60	400	$ 2,400.00
Disposal	0.6	$ 6.00	2.4	$ 24.00	600	$ 6,000.00
Time	2	$ 0.67	8	$ 2.67	2000	$ 666.67
		$ 19.07		$ 76.27		$ 19,066.67

CC Flush	Volume	Cost Per Flush	Vol Per Day	Cost Per Day	Vol Per Year	Cost Per Year
Material	0.3	$ 15.00	3	$ 150.00	750	$ 37,500.00
Solvent	3	$ 18.00	30	$ 180.00	7500	$ 45,000.00
Disposal	3.3	$ 33.00	33	$ 330.00	8250	$ 82,500.00
Time	4	$ 1.33	40	$ 13.33	10000	$ 3,333.33
		$ 67.33		$ 673.33		$ 168,333.33

Total Cost	Vol Per Day	Cost Per Day	Vol Per Year	Cost Per Year
Material	3.8	$ 190.00	950	$ 47,500.00
Solvent	31.6	$ 189.60	7900	$ 47,400.00
Disposal	35.4	$ 354.00	8850	$ 88,500.00
Time	48	$ 16.00	12000	$ 4,000.00
		$ 749.60		$ 187,400.00