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axpaint box System

Sectional Door Panels

Automated High-Speed Painting

axpaint box

Sectional Door Panels Painting

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axpaint box Introduction

The axpaint box system is a unique automated system for high volume painting of door panels with minimal labor — and, at a consistent high level of quality.

axpaint box completely integrates all components for a turn-key solution.

- axpaint box system **paints up to 600 linear meters of panels per hour**
- **No painting skills required**
- **Consistent high level of quality**
- **RAL and / or Pantone colors**
- **Use your own paint** — no change in supply required
- **Fully automatic system** with minimal labor required
- **Minimal space required** compared to typical manual spray painting enclosures
- Paint thickness: 60 microns wet ≈ 30 microns dry
- Typical paint cost of €1,50 per m^2
- **Suitable for painting other items similar to door panels**

Panel Dimensions

- Length: 1.500 - 14.000 mm
- Height: 100 - 700 mm (up to 1.200 mm optional)
- Thickness: 10 - 100 mm (> 100 mm optional)

Automated High Speed Painting for Door Panels

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Advantages & Benefits

All axpaint box users:

- Increase sales, profits and market share with custom painted door panels
- Offer the full range of RAL and / or Pantone colors
- Offer all panel styles in all colors — residential and industrial
- No painting skills required
- Minimal labor requirements
- Workers not exposed to spray paint
- Consistent application of paint resulting in high quality finish
- Fast production rates of up to 600 linear meters per hour
- No minimum production run — every panel can have a different color
- Only 5 minutes to change paint colors
- Dried paint thickness of 30 – 35 microns, superior to typical 25 microns for panels manufactured with pre-painted coils
- Minimal overspray paint waste with 80 – 90% efficiency
- Increase sales and income by painting other materials similar in size to door panels

Offer the full range of RAL & Pantone colors

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Advantages & Benefits

Panel Manufacturers

- Increase sales and profit margins by offering a complete range of RAL and/or Pantone colors without minimum order requirements to customers
- Increase market share by offering a unique service from a panel manufacturer
- Substitute low volume panel manufacturing of a specific color by painting galvanized or white panels
- Eliminate rarely used color steel coil inventory
- Reduce costs by painting panels made from coils without paint finish (only galvanization + primer)

Door Manufacturers

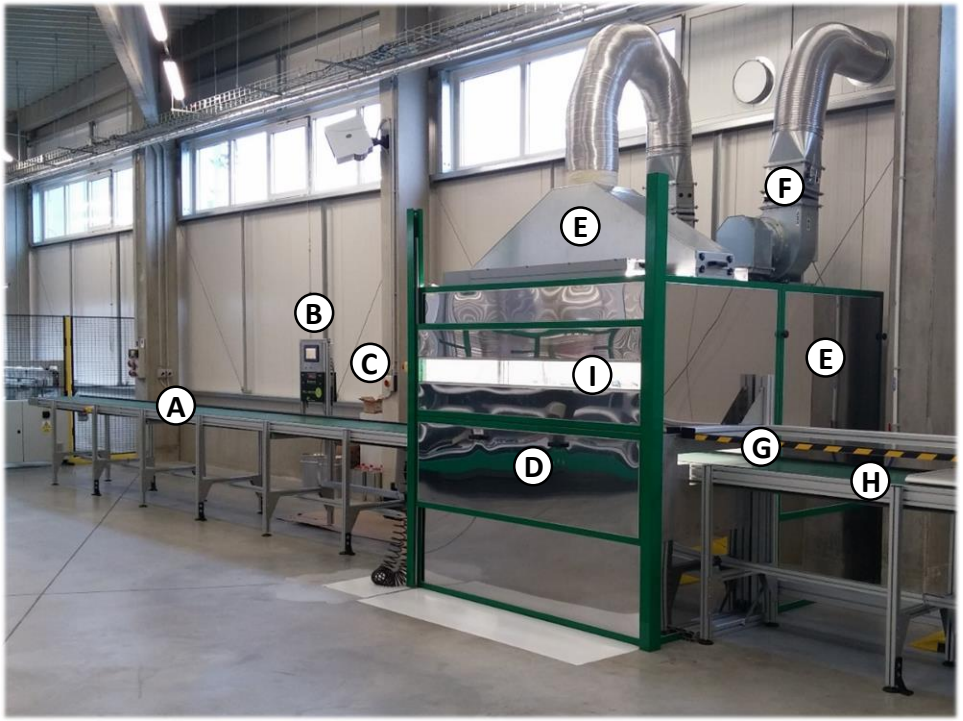
- Reduce or eliminate panel and steel coils inventory
- Substitute low volume panel manufacturing by painting galvanized or white panels
- In-house painting:
  - No need to change paint type or suppliers
  - Reduce painting labor costs
  - Reduce skilled painting labor requirements
  - Note: manual painting required for windows, full vision sections and pass / pedestrian / wicket doors

Door Assemblers

- Reduce or eliminate panel inventory for many panel style / color combinations
- In-house painting:
  - No need to change paint type or suppliers — the axpaint system can be configured to use your own paint
  - Reduce painting labor costs
  - Reduce skilled painting labor requirements
  - Note: manual painting required for windows, full vision sections and pass / pedestrian / wicket doors
- Make extra sales and profits by painting panels similar in size to door panels

System Components: Page 1

- axpaint box master control unit
- Panel surface pre-treatment equipment:
  - Soft, rotary, anti-static brushes for cleaning the panel surface
  - Vacuum to remove particles and dust
  - Air blade for additional particle and dust removal
  - Semi-enclosed housing on inbound conveyor
- Fully enclosed painting box
- Spray head for panel face painting:
  - Medium pressure spray head
  - Electric 1-axis linear actuator manipulator
- Spray head for panel bottom edge painting
- Optical sensors:
  - Fixed to panel face spray head manipulator
  - One determines the panel start and end (1.500 – 14.000 mm)
  - One measures the panel height (100 – 700 mm)
  - Note: sensors automatically determine panel length and height — no programming or data entry required



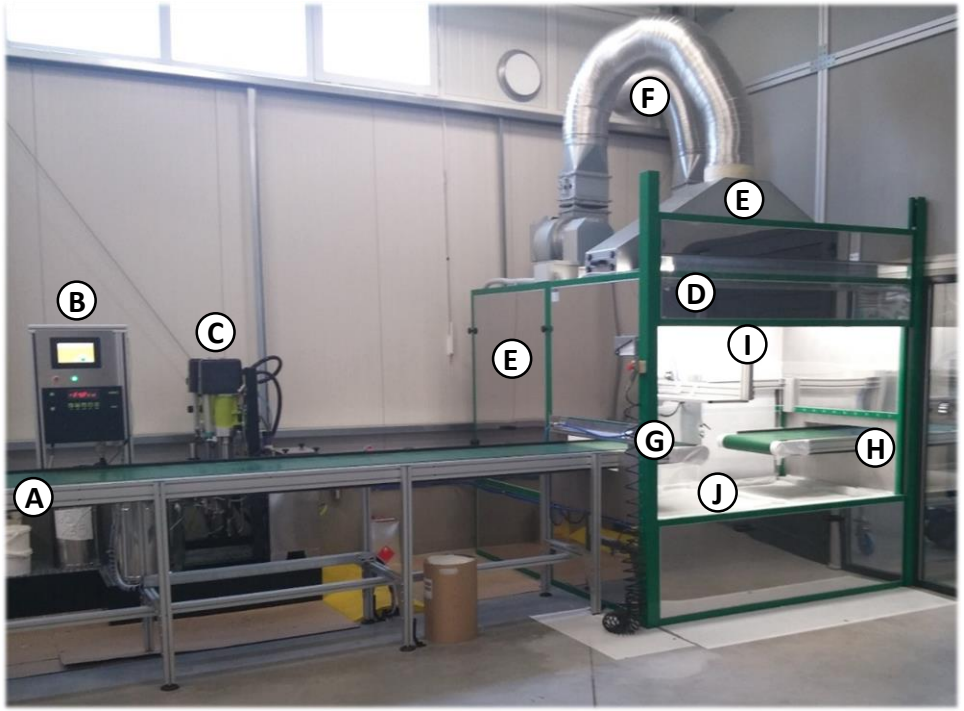
axpaint box System

A) Panel conveyor inbound
B) Paint mixing control unit
C) Paint mixing pumps (not shown)
D) Painting enclosure with door closed
E) Air recirculation system
F) Exhaust system
G) Panel entry / exit openings (provides air intake)
H) Panel conveyor outbound
I) Inspection window

Note: panel preparation equipment not shown

System Components: Page 2

- Paint mixing unit with 3 pumps and controller with display:
  - Paint base
  - Hardener supplementary component
  - Flushing system
- Color mixing unit using 7 – 16 colors to create RAL and/or Pantone colors (optional – many customers already have a mixing unit)
- High pressure piston pump system for paint air supply
- Ventilation system:
  - Negative pressure system
  - Air recirculation system with active charcoal filters
  - Low frequency ventilators
- Textile down draft filtration system (water filtration system optional, when allowed by environmental regulations) Panel conveyors in and out of the painting enclosure: up to 15 m each
- Explosion-proof components and enclosure
- Automatic computer controlled panel racking system (optional)
- Drying room (not included)

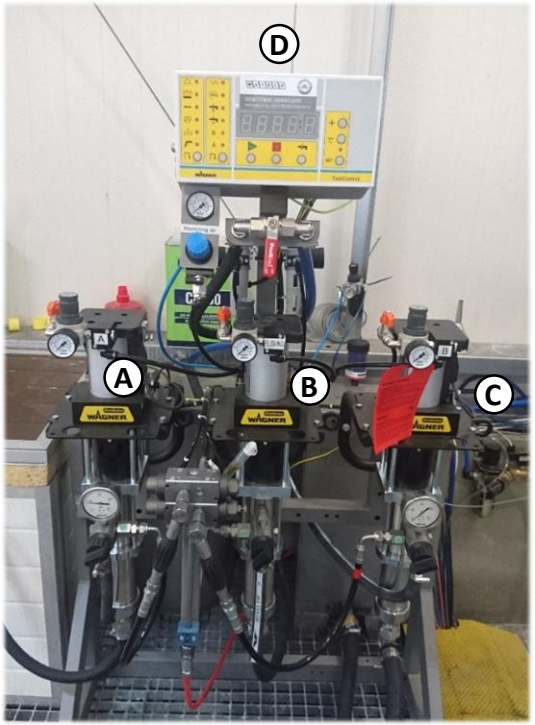


axpaint box System

A) Panel conveyor inbound
B) Paint mixing control unit
C) Paint mixing pumps
D) Painting enclosure with door open
E) Air recirculation system
F) Exhaust system
G) Panel entry / exit openings (provides air intake)
H) Panel conveyor outbound
I) Spray head manipulator arm
J) Downdraft textile filter

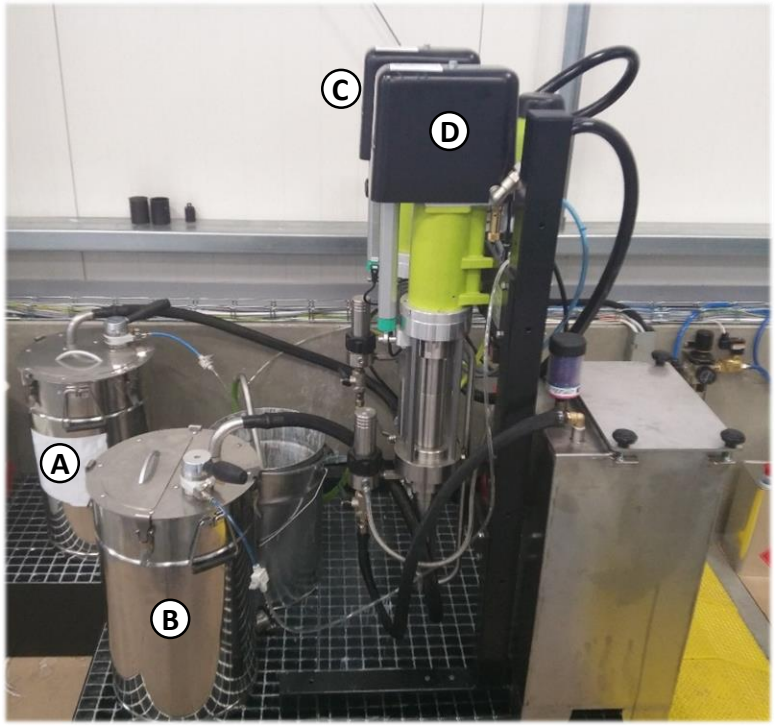
Note: panel preparation equipment not shown

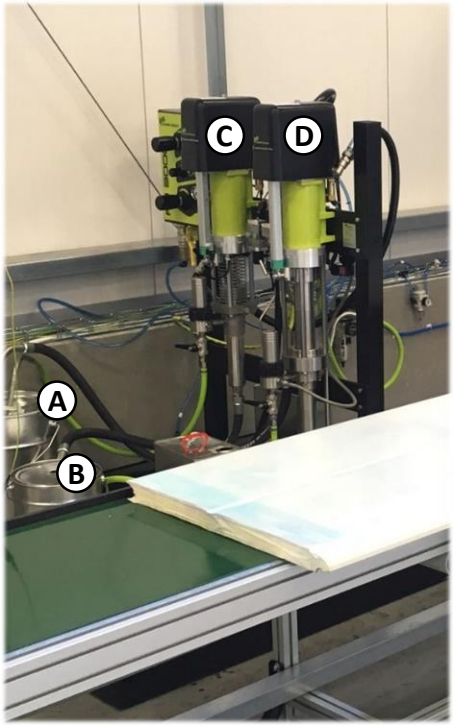
System Components: Page 3



Paint Mixing Unit

A) Base (paint) component
B) Flushing (cleaning)
C) Drying and hardener components
D) Controller with display

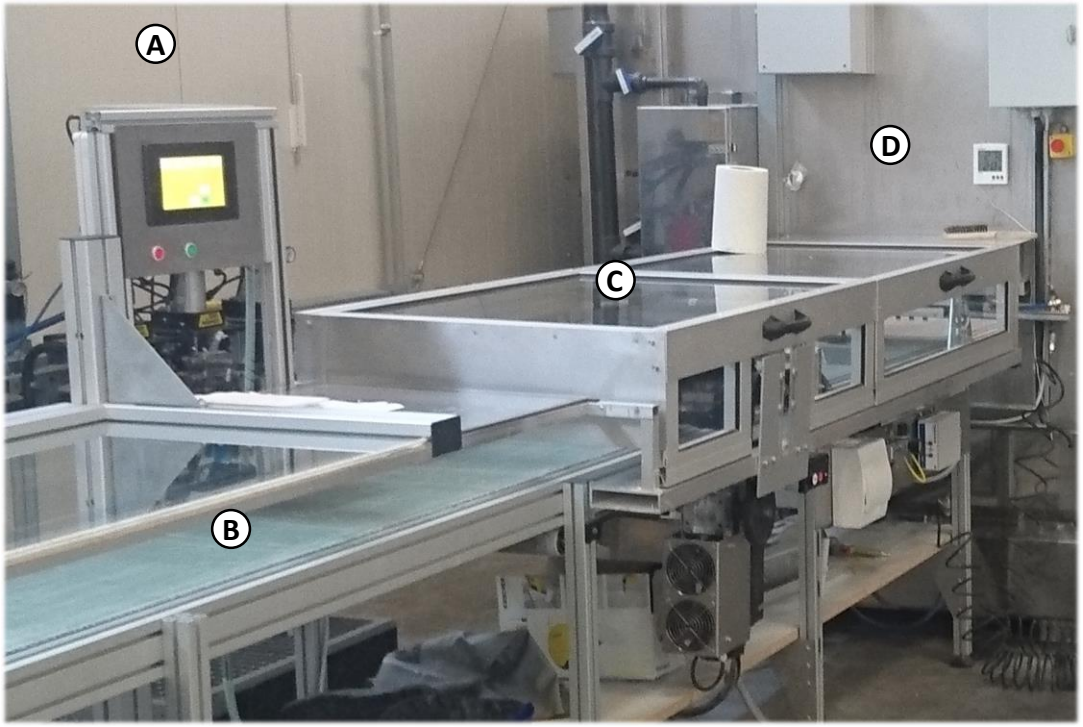




Paint Component Containers and Pumps

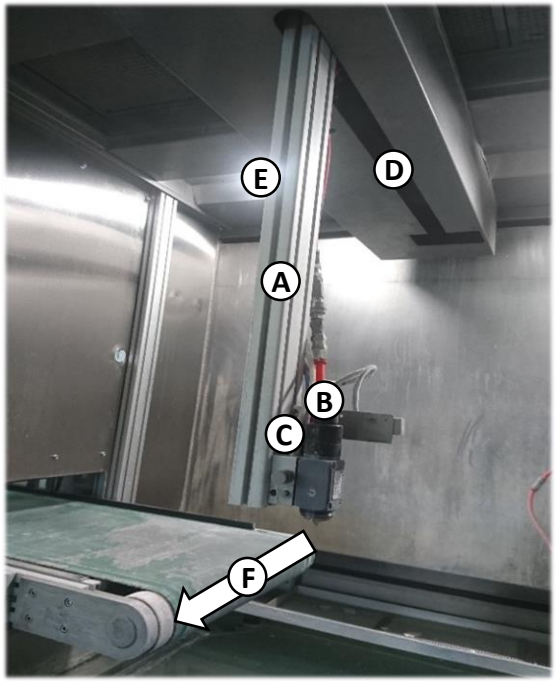
A) Drying and hardener container
B) Base (paint) container
C) Drying and hardener pump
D) Base pump

System Components: Page 4



Panel Preparation Area on Inbound Conveyor

A) Master controller
B) Panel conveyor inbound with cover
C) Panel preparation: rotary brush, vacuum and air blade
D) axpaint box enclosure



Spray Head Manipulator Arm & Sensors

A) Manipulator arm
B) Paint spray head for panel face painting
C) Optical sensors
D) Linear actuator for spray head arm
E) Inspection light
F) Direction of spray painting (from top to bottom)

Note: spray head for bottom edge painting not shown

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Painting Production Process

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1) Panel Preparation

- The exterior protective panel folio is removed
- Panel is loaded onto the inbound conveyor belt (manually or automatically)
- Rotary brush sanders clean the panel surface
- Vacuum equipment removes dust and particles
- Air blade removes any remaining dust and particles

2) Painting

- System Operator loads the current paint job in the axpaint computer management system
- Panel automatically moves on the conveyor into the painting enclosure through a rectangular opening
- The end optical sensor determines the panel start position and painting starts for the first pass
- The height optical sensor determines the panel height and when to stop painting at the bottom edge
- The edge painting spray head continuously paints the bottom edge
- The spray manipulator arm returns to the start position while the panel continues moving through the painting enclosure; and, paints additional passes
- Painting continues to the end of the panel

3) Panel Exit from Painting Enclosure

- The panel automatically moves onto the outbound panel conveyor while in the painting enclosure
- The painted panel exits the painting enclosure on the outbound panel conveyor

4) Panel Drying

- The panel is loaded onto a rack in the drying room manually or automatically (optional). The axpaint system can automatically manage panel racking and inventory drying panels.
- Drying time depends on many variables

5) Painted Panels Removal

- Panels are unloaded from drying racks manually or automatically (optional). With the optional axpaint racking system a worker can select panels (example: one door) for removal.
- The optional axpaint racking system will automatically unrack panels and transfer them by conveyor out of the drying room through an exit hatch — ready for door production or panel shipment

Painting Production Rates

- Cleaning time between color changes: ≈ 5 minutes
- Start-up time: ≈ 5 minutes
- Shut-down time: ≈ 5 minutes

Garage Doors Example: Every Door a Different Color

- Garage door with 4 panels x 4.000 mm
- Total panel length: 4 panels x 4 m = 12 linear meters
- Painting time: 16 lm / 10 lm per minute = 1,6 minutes
- If every door is a different color, 5 minutes for cleaning between each door
- Total time for one door: 6,6 minutes
- Production per hour: 9 doors (144 lm)

Logistics Doors Project Example: 30 Doors the Same Color

- Door dimensions: 3.500 x 3.500 mm with 6 panels
- Total panel length: 6 panels x 3,5 m = 21 linear meters
- Painting time: 21 lm / 10 lm per minute = 2,1 minutes
- Cleaning time of 5 minutes after the 30 door job
- Total production time: (30 doors x 2,1 minutes) + 5 minutes = 68 minutes
- Total time for one door: 2,3 minutes
- Production per hour: 26 doors (546 lm)

axpaint Painting Production Rates			
	Per Minute	**Per Hour**	**Per 8-Hour Shift**
Panels: 100 – 610 mm	10 lm	600 lm	4.800 lm
Panels: 500 mm	5,00 m^2	300 m^2	2.400 m^2
Panels: 610 mm	6,10 m^2	366 m^2	2.928 m^2

Cleaning

- Cleaning (flushing of the lines) requires approximately 5 minutes between color changes
- Approximately 5 minutes is needed for cleaning at the beginning and end of each shift

No Affect on Production Rates

- Panel heights: 100 – 610 mm
- Panel lengths: 1.500 – 14.000 mm
- Panel styles: cassette, ribbed, flat …
- Panel surfaces: woodgrain, stucco, smooth …

Panel Drying

- Drying time depends on:
  - Thickness of wet paint (i.e., the paint film)
  - Curing time for the paint resin
  - Evaporation rate of each solvent (solvent based paints)
  - Drying room:
    - Temperature
    - Humidity level
    - Air flow rate
- Automatic panel racking system available for drying panels (optional)
  - Computer managed
  - Automatically racks panels onto drying racks
  - Computer system inventories drying panels
  - Panels can be organized by job (example: one door)
  - Panels automatically retrieved and conveyed out the exit hatch
- Drying room is not included

Drying Room with Automatic Panel Racking System (optional)

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Space Requirements & Technical Details

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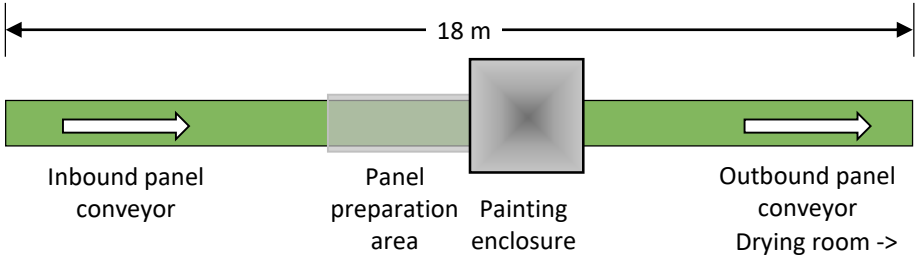
axpaint box Space Requirements

- The axpaint box system has three large components, not including the drying room:
  - Inbound panel conveyor with panel preparation area
  - Painting enclosure ("the paint box")
  - Outbound panel conveyor
- Panel conveyors are up to 17 m long, depending on the max length of the painted panels
  - Inbound conveyor: panel length + 3 m for panel preparation area
  - Outbound conveyor: panel length + 1 m
- Painting enclosure is 2 x 2 m
- Total length is 16 – 32 m
- Drying room space requirement depends on many variables — from production rate and panel lengths to drying times and panel racking system

Example for painting 6 m long panels: conveyor inbound 9 m + paint box 2 m + conveyor outbound 7 m = 18 m



Technical Details

- Solvent base paint (water base paint optional)
- Constant fluid flow rate
- Pulsation free system prevents spray pattern variation
- Fluid output: up to 2.000 cm^3 per minute
- Unique pump changeover technology ensures consistent metering and fluid flow rates
- Mixing accuracy +/- 1% due to the innovative pump changeover technology
- Continuous mixing auto-adjustment
- Injectmix technology allows injecting a custom catalyst volume into a continuous flow of base for best mixing quality
- Automatic component management: base and hardener
- Low air pressure: max 6 bar
- Waste:
  - Volume of flushing solvent limited to real mixed material
  - Approximately ½ liter of mixed A + B components
  - Approximately 1 liter of solvent
  - Estimates based on tube lengths of 2 – 3 m

Labor

Labor: Production

- Only one worker is required to operate the axpaint box system:
  - Programming paint jobs
  - Managing the paint mix system
  - Cleaning the system when changing colors
  - Quality control of inbound panels
  - Quality control of painted panels
- Depending on the production volume, panel lengths and panel handling equipment —additional workers may be required (automated panel handling optional)

Labor: Panel Logistics

- Inbound panels:
  - Panels delivered and positioned near the panel preparation area
  - Panels loaded onto the inbound conveyor for panel preparation manually or automatically (optional)
- Outbound panels:
  - Painted panels moved from the outbound conveyor to the drying room*
  - Panels removed from the drying room*

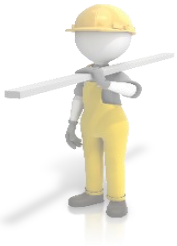
*Automated panel handling and racking system optional

Labor: Comments

- Spray painting panels requires consistent quality work with attention to detail
- Painting is unpleasant, boring and hazardous work
- Workers must wear protective clothing and respirator masks, which are hot and uncomfortable
- There are many health hazards from paint exposure
- Companies have difficulty keeping painting workers
- High pay for workers is often not a solution — other painting jobs often pay more
- axpaint box system labor advantages:
  - *Eliminates* spray painting labor
  - No special skills required
  - Workers not exposed to spray paint
  - Workers do not need to wear protective respiratory masks and clothing

System Operator

Panel Preparer(s)



Inbound Panels

Outbound Panels

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Seals, Alu Profiles & Panels, Limits

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Weather Seals on Panels

- axpaint has several solutions **for not painting panel weather seals**
- Female joint foam or rubber seals: solution is the position of the bottom edge spray head
- Male joint rubber seals: an air knife will prevent paint spray on the seal (optional)
- Note: most panels have seals only on the female joint

Aluminum Profiles: Top & Bottom Seals

- Profiles fixed to panels before painting:
  - Top and bottom profiles for weather seals painted on the exterior together with the panel face
  - A small amount of the top and/or bottom edge of profiles is painted for the best appearance
- Profiles painted separately:
  - Paint the exterior or interior
  - Paint in batches of 3 -15 pieces of the same length and color ≈ 1.800 – 9.000 lm per hour
  - Custom racks hold profiles for painting and drying (optional or customer supplied)

Aluminum Industrial Door Panels

- Aluminum panels usually are supplied without a paint finish on the exterior and interior
- Many aluminum doors are painted on the exterior
- The axpaint system is a the **high speed solution for painting aluminum panels** on the exterior and/or interior
- Note: testing required to ensure paint compatibility with a specific aluminum finish

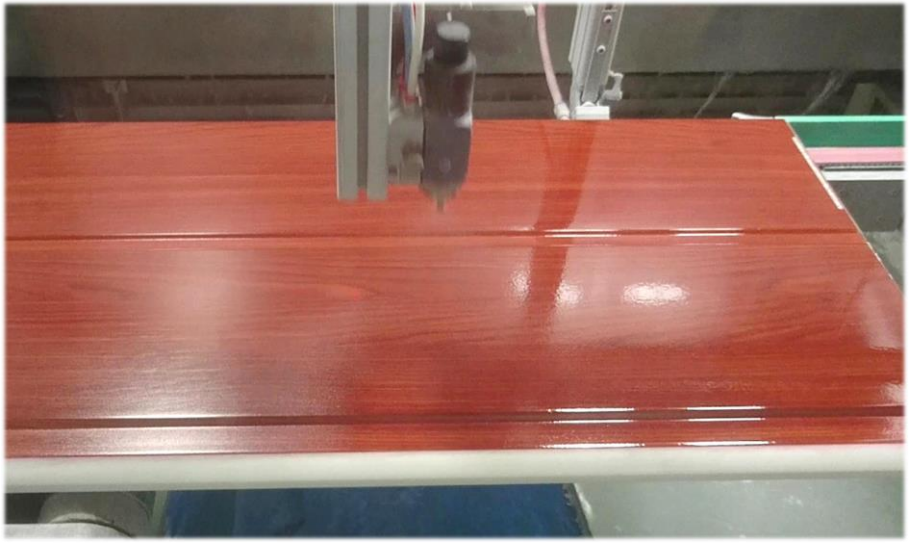
What axpaint box Cannot Paint

- The axpaint system has a *1-axis, 1-direction* painting process: from the top of the panel to the bottom
- Manual painting is needed for items that require *multi-axis, multi-direction* painting:
  - Window frames
  - Pass doors / pedestrian doors / wicket doors
  - Full vision sections or profiles
  - Interior face of finger-protection panels
- Note: traditional tongue & groove industrial panels can be painted on the interior face by axpaint box

axlacquer box Module (optional)

- The axlacquer box module can be added to the axpaint box system for spray painting of lacquer
- axlacquer box is a key component of the axpanel digitial printing system
- Lacquer custom painted or standard paint panels for improved resistance to corrosion, fading and scratching
- Lacquer is available with various specifications and technical characteristics
- Fully automated system like axpaint box
- Production rate of up to 1.200 linear meters per hour
- Lacquer provides the opportunity to provide longer warranties for exterior panel performance
- Lacquer the interior face of panels for special uses, such as car washes or other corrosive environments
- Lacquer exterior building materials similar in size to door panels for additional sales and profit
  (may require additional equipment or modifications)

Note: lacquer application shown on right is for the axpanel digital printing system for door panels



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Sectional Door Panels Painting

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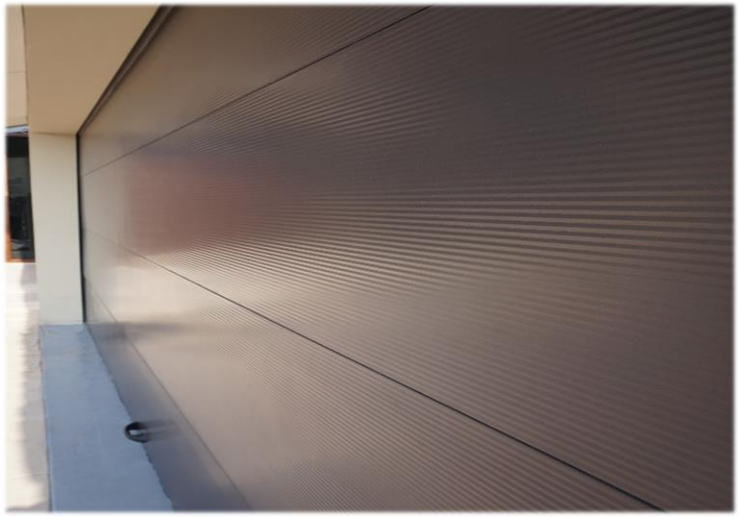

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Rev. 18.11.2019