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axpanel System

Sectional Door Panels

Digital Inkjet Printing

Digital Printing — The Future for Garage Doors

Sectional Door Panels Printing

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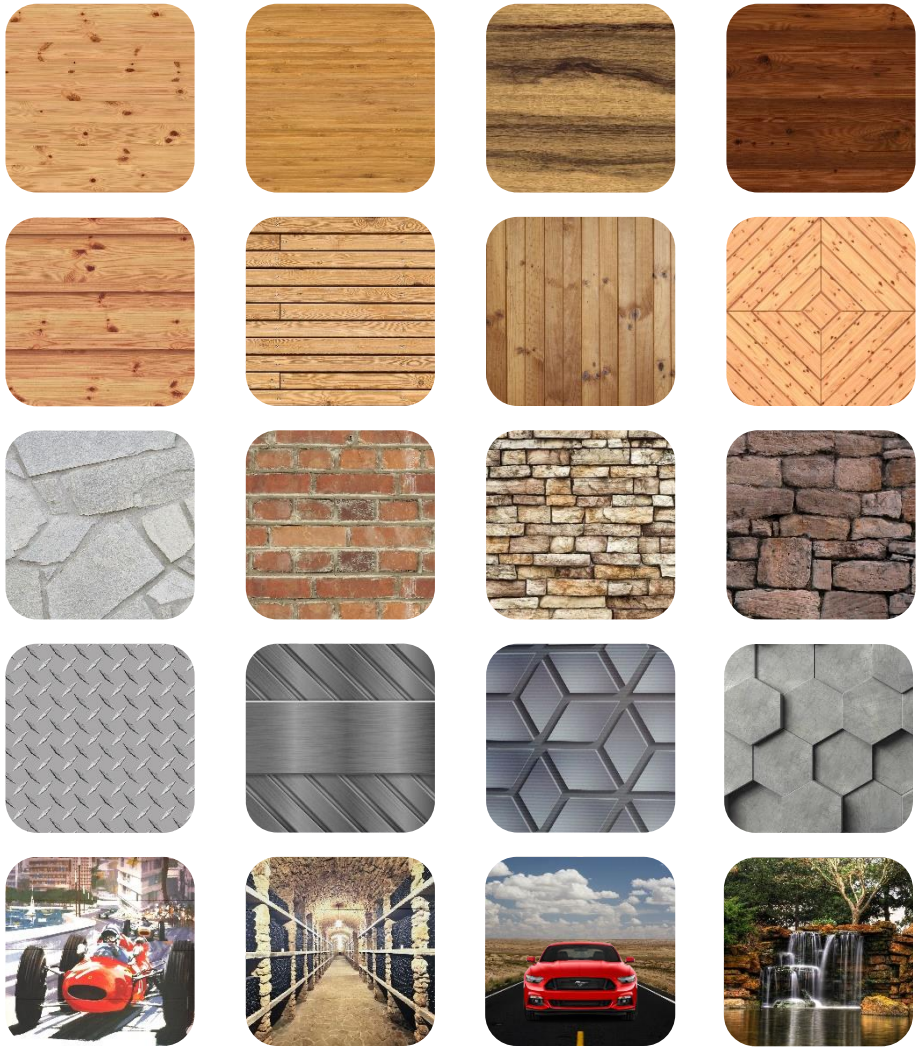
axpanel Introduction

- axpanel is the **first proven system** for digital inkjet printing on sectional door panels
- Z-axis technology prints the bottom edge of the panel with **no white space between panels**
- **100.000 design possibilities** — prints almost any type of design, graphics art, scan or photograph
    - 16.000.000 possible colors with 4-color CMYK ink
    - High quality optical resolution up to 720 dpi
    - Print complete door designs
    - Custom designs for individual doors
    - 3D effects!
- **Replace expensive steel coils and panel inventory with only ink and lacquer**
- **Add new panel styles, designs and colors to increase sales and profits** — without increasing inventory
- Uses **standard panels**, typically white color
- **Fast production:**
    - Only a few seconds between print jobs
    - No minimum production run quantities — every panel can be completely different
- Printed panels sprayed with automobile grade polyurethane lacquer. **Lacquer provides superior resistance to corrosion, fading and scratches.**

Digital Printing — The Future for Garage Doors



axpanel Digital Inkjet Printing

Production Process

- Panel preparation: light sanding and vacuum cleaning
- Printing and ink curing: panel position check and measurement, panel rotation of 90º for 4-pass printing of the bottom edge, panel rotation back to the flat position, several printing passes of the panel face
- Lacquer: panel sprayed with protective lacquer
- Drying: panel automatically racked in the drying room
- Removal: panel automatically unracked and moved out of the drying room by the computer management system

Door Panels

- Only standard panels required, typically white color
- Print most styles: cassette, ribbed, flat …
- Print most surfaces: woodgrain, stucco, smooth …
- Panel lengths: 1.500 - 10.200 mm
  (note: longer panels are possible to print)
- Panel heights: 100 - 610 mm

Cassette

V-ribbed

U-ribbed

Micro-ribbed

Digital Inkjet Printing Inventory

- Ink: 4 colors CMYK
- Lacquer
- Each design stored as a computer graphic file

4 ink colors

Lacquer

Design files

axpanel

Door Panels with Wood Designs

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Wood Design Panel Combinations Today

Styles

- Cassette
- V-ribbed
- U-ribbed
- Flat
- Other styles

Surfaces

- Woodgrain
- Smooth

Wood Design Finishes

- Paint: 2-color
- Dye Sublimation: 2 or more colors
- PVC Folio: 2-color

Colors

-
-
-
-
-
-

Number of colors varies by company

Examples:
Golden Oak
Mahogany

Styles + Surfaces + Wood Design Finishes + Colors = many panel combinations for production and inventory

Problems for the Door Industry

The door industry has traditionally been slow to add new styles, surfaces and finishes – in comparison to other exterior building materials. In the past 10 years, the number of door style + surface + finishes + color combinations has increased significantly.

The many panel combinations causes production and inventory problems for panel producers, door manufacturers and door assemblers.

Competition to have more combinations is increasing.

The market trend is more options for styles, surfaces, colors and designs … Digital printing is a solution.

Door Industry Problems	Panel Manufacturers	Door Manufacturers	Door Assemblers
More steel coils inventory	√	√	
More panel inventory			√
Shorter production runs	√	√	
More production set-ups	√	√	
Clients want small orders	√		
Multiple panel suppliers			√
Increased competition	√	√	√

Designs, Graphics & Limitations

Wood Designs: Replacement

- Replaces inventory of wood design steel coils or panels
- White panels used for printing
- Print on most panel styles: cassette, ribbed, flat …
- Print on woodgrain or smooth surfaces
- Print virtual cassette styles with 3D effects
- Note: digital printing may not provide costs savings for high volume wood designs (Example: Golden Oak)

Wood Designs: New

- Easily add new wood designs: Bamboo, Cherry, Teak … for a small investment in new graphics files
- 4-color digital printing has better resolution and/or more colors than typical wood designs for door panels
- Print woodgrain in any orientation — not just horizontal
- Print complete door designs — not just have the same design on every panel

Other Designs: 100.000 Possibilities

- Digital printing provides thousands of new design opportunities —see "axpanel Sectional Door Panels Digital Printing Designs" for more information

Graphics & Digital Printing

- Designs use raster and / or vector graphics.
- Raster graphics: made from individual pixels, like a photograph or scan. Wood designs use raster files.
- Vector graphics: made from mathematical formulas. Logos and fonts are typical examples
- Thousands of graphic designs readily available. Or, make your own.

Digital Printing Limitations

- Inkjet printing is not for 1-color panel printing because of streaks. Use standard 1-color panels or paint with the axpaint box system.
- Larger 1-color areas may show streaks. Good graphics design can prevent poor printing results.
- Maximum depth of ribs or cassette blocks is 6 mm. This is the max depth for acceptable print resolution.
- Some panels have 90° joint angles, which are difficult to print. Finger-protection panels print very well.

Digital Printing — The Future for Garage Doors

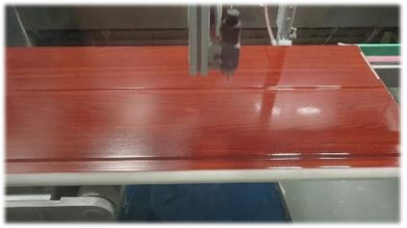
axpanel System

- axpanel computer management system
- Panel preparation:
  - Panel sanding equipment
  - Vacuum system to remove dust and particles
  - Conveyors + access hatch to printing clean room
  - Panel loading equipment (optional)
- Printing and ink curing:
  - Printhead carriage with digital inkjet print heads and ink curing light
  - Optical control equipment
  - Z-axis vacuum table to hold panels
  - Clean room air filtration and ventilation system
  - Conveyors + access hatch to lacquer application
- Lacquer spray application (axlacquer box):
  - Lacquer application spray box
  - Water filtration system
  - Conveyors + access hatch to drying room
- Drying room equipment:
  - Computer managed panel racking system
  - Panel drying racks
  - Conveyor + exit hatch for completed panels

Panel Preparation

Printing & Ink Curing

Lacquer Application



Panel Drying Room

axpanel Computer System

Space Requirements & Labor

axpanel Space Requirements

- axpanel systems require 60 - 100 m^2 depending on the production system speed (low, medium, high)
  - Panel preparation area
  - Printing room (clean room)
  - Lacquer application area
- Drying room requires 100 - 200 m^2

Labor: Production

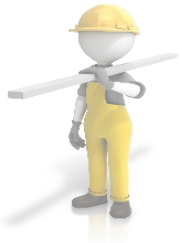
- System Operator: operates the axpanel computer management system and ensures the panel position before printing. Assists the panel preparer if panel loading is manual (optional automated panel loading)
- Panel Preparer: removes protective folio from the panel, inspects panel for defects, loads panel onto the preparation table (optional automated panel loading)

Labor: Panel Logistics

- Inbound panels: workers deliver and position panels into the panel preparation room
- Outbound panels: workers receive finished panels from the drying room
- Number of workers depends on customer's logistics system

System Operator

Panel Preparer



Inbound Panels

Outbound Panels

Production Process

1) Panel Preparation

- The exterior protective panel folio is removed
- Panel is loaded onto the preparation table (manually or automatically)
- Rotary anti-static brush sanders clean and abrade the panel surface
- Vacuum and air knife equipment removes dust and particles
- The panel transfers on a conveyor system to the printing clean room through a transfer hatch

2) Digital Printing & Ink Curing

- System Operator loads the current print job in the axpanel computer management system
- Panel is positioned flat onto the vacuum table
- Printhead carriage system optically checks the panel's position, dimensions and height
- Panel is rotated on the Z-axis 90º to print the bottom edge with 4 printing / ink curing passes
- Panel is rotated back to the flat position
- Printhead carriage makes several passes, printing the panel face and the lower part of the male joint
- Panel transfers on a conveyor system to the lacquer spray box through a transfer hatch

3) Lacquer Application

- The panel is automatically sprayed on the exterior with an automobile grade polyurethane lacquer
- Lacquer has a matt finish
- The lacquer, after drying, is 30 – 40 microns thick
- Panel transfers on a conveyor system to the drying room through a transfer hatch

4) Panel Drying

- The panel is automatically loaded onto a rack in the drying room by the axpanel computer management system. The system inventories drying panels.
- Panels dry for 30 minutes to 6 hours
- Drying time depends on the lacquer type, thickness, room temperature, humidity and air flow

5) Finished Panels Removal

- After drying, a worker selects panels (usually for one door) with the computer management system
- Panels are automatically unracked and transferred by conveyor out of the drying room through an exit hatch — ready for door production or panel shipment

Production Rates

axpanel Production Rates by System Panel Length: 4.000 mm				
axpanel Production Systems		**Low Volume**	**Medium Volume**	**High Volume**
Number of printhead carriages		One: for the panel face and the bottom edge	Two: one the for panel face + one for the bottom edge	Three or Four: two for the panel face + one or two for the bottom edge
Printhead type		Standard	Standard	Advanced "E" series
Time per panel		240 sec	90 sec	45 sec
Number of panels	per hour	15 pcs	40 pcs	80 pcs
	per 8-hour shift	120 pcs	320 pcs	640 pcs
Linear meters	per hour	60 lm	160 lm	320 lm
	per 8-hour shift	480 lm	1.280 lm	2.560 lm
Square meters: 500 mm panels	per hour	30 m^2	80 m^2	160 m^2
	per 8-hour shift	240 m^2	640 m^2	1.280 m^2
Square meters: 610 mm panels	per hour	36 m^2	97 m^2	195 m^2
	per 8-hour shift	288 m^2	776 m^2	1.560 m^2

Production Rates & Consumables

Production Rates Notes

- Printing is the slowest step in the production process, except for panel drying
- Production rates can be increased by printing longer panels and then cut into 2 – 4 panels. For example, print a 10.200 mm panel and cut into 4 x 2.550 mm panels after they are dry. Each 2.550 mm section of the 10.200 mm panel would have its own design.

No Affect on Production Rates

- Number of colors, designs or ink coverage
- Changes in design from one panel to the next
- Panel heights: 100 – 610 mm
- Panel styles: cassette, ribbed, flat …
- Panel surfaces: woodgrain, stucco, smooth …

Consumables & Inventory

4 ink colors


Lacquer


Design files

Ink Coverage / Usage

- Darker designs use more ink (higher ink coverage %)
- Wood designs: 40 – 95% (average: 80%)
- Other designs: 10 – 95%


Natural Oak
40%


Golden Oak
60%


Cherry
70%


Mahogany
90%


Quarry Stones
30%


Steel Diamond
55%


Stone Wall
70%


Corten
85%


Hexagons
40%


Ivy Leaves
50%


Camouflage
70%


Metal Angle
75%

Lacquer & Paint Spray Boxes

axlacquer box: Additional Uses

- Production rate: up to 1.200 lm per hour
- In addition to spraying lacquer on printed panels, the lacquer box may be used for standard door panels or other building materials to make additional income
- Lacquer standard paint finish door panels for improved resistance to corrosion, fading and scratching. Longer warranties are possible to give to customers.
- Lacquer the interior panel face for special uses
- Lacquer exterior building material panels
  (may require additional equipment or modifications)

axlacquer box

axlacquer box + axpaint box Option

- Optional module for 1-color spray painting is available for the axlacquer box (added to the axlacquer box – not the stand-alone axpaint box unit shown right)
- Paint door panels automatically with minimal labor
- No special worker skills required
- RAL or Pantone colors (both available as an option)
- Painting production rate: up to 600 lm per hour
- Paint panels up to 14.000 mm long
- Short cleaning time between color changes: ≈ 5 min
- Paint other flat materials for extra income
  (may require additional equipment or modifications)

Stand-Alone axpaint box

See " axpaint box System" for more information

100.000 Design Possibilities

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