

CASE STUDY: Composite Garage Door

BACKGROUND

The client, one of the premier garage door companies in the world, wanted to grow their business. They had made a strategic decision to achieve this growth by delivering a differentiated class of premium products to the market. The premium product would be a line of fiberglass garage doors with the beauty of natural wood and the durability of steel.

They chose Aptimise as a key partner to lead the project. The project would include market research, design, specification, process development, and prototyping.

CHALLENGES

The first challenge was in the size and molding detail of the product. Garage doors can be very large parts, up to 18 feet long and 8 feet tall. The individual panels are manufactured from sheet molding compound (SMC), the same fiberglass body material as the Chevy Corvette, using up to 2000 tons of pressure. In addition, the final product required molded-in high definition wood grain. Further, new, precise processing controls for finishing were required to ensure color matching of multiple panels installed together.

Adding to the project's complexity, resources from five different U.S. and international companies would be involved in the project.

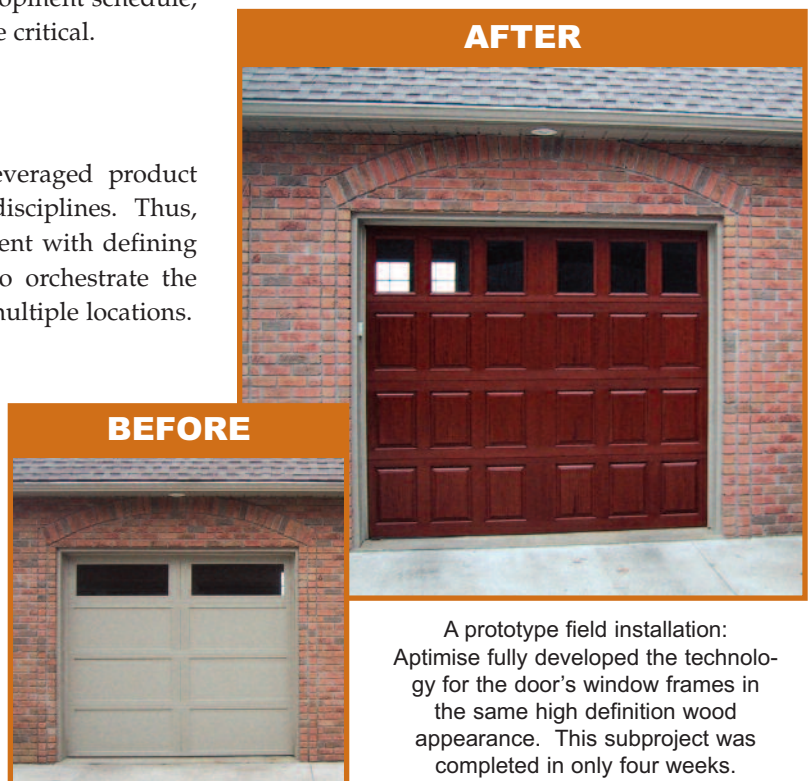
Finally, the client wanted to display product at the International Builders Show (IBS) – a key marketing opportunity that occurs just once per year. This left just 14 weeks to go from concept to marketing-ready prototypes. Given the compressed development schedule, project planning and execution would be critical.

SOLUTIONS

To meet these challenges, Aptimise leveraged product development and project management disciplines. Thus, they were able to not only assist the client with defining the end product, but were also able to orchestrate the activities of several groups working in multiple locations.



Consultants in competitive advantage



A prototype field installation: Aptimise fully developed the technology for the door's window frames in the same high definition wood appearance. This subproject was completed in only four weeks.

CASE STUDY: Composite Garage Door (continued)

SOLUTIONS

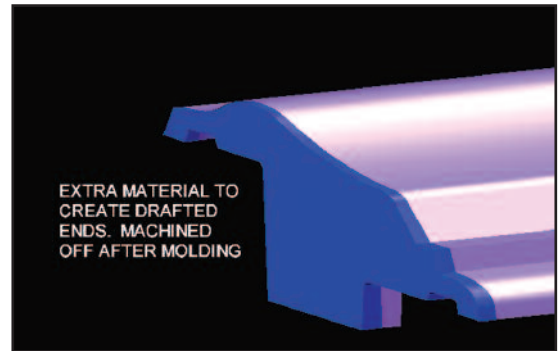
Initial efforts were focused on transforming the client's concept into a fully specified design. Aptimise supplemented marketing data on the U.S. garage industry. Then, they drew upon their expertise in market popularity of various wood species and molding techniques to achieve those wood looks.

Next, Aptimise provided insights into aesthetics of wood layout and worked with the customer's designers, the molder's engineers, and the toolmaker's craftsmen to develop state-of-the-art compression molds. As part of this service, Aptimise provided the final 3-D solid CAD models of the product, enabling transfer of data direct to the toolmaker's machining center.

In development of a manufacturing process, Aptimise assisted the client's engineering staff with process specifications, adhesive selection, and materials handling.

In addition, Aptimise fully developed the technology for the door's window frames in the same high definition wood appearance. This subproject was completed in only four weeks.

Finally, Aptimise delivered prototypes needed for the IBS, as well as preparatory samples.



| | |
|--------|-------|
| Color | Green |
| Better | +1.0 |
| Same | 0.0 |
| Worse | -1.0 |

An example of a Quality Function Deployment chart, one of the tools used in developing specifications

| DIMENSION | TECHNICAL IMPORTANCE | | | | | TECHNICAL IMPORTANCE |
|--|----------------------|---------|---------|---------|---------|----------------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Draw highlight file grain to match, maximum | ★ | ★ | ★ | ★ | ★ | 14.0 |
| Roughness Ra is less than 1200 um | ★ | ★ | ★ | ★ | ★ | 13.10 |
| Accelerated aging QUV 5000 hr with no cracking | ★ | ★ | ★ | ★ | ★ | 5.0 |
| Flexil hardness of topcoat 15 min after drying to minimum HB | ★ | ★ | ★ | ★ | ★ | 2.8 |
| Taber abrasion less than 10% | ★ | ★ | ★ | ★ | ★ | 5.0 |
| AESTHETICS | | | | | | |
| Grain less than 20 units | ★ | ★ | ★ | ★ | ★ | 5.0 |
| Stain "a" and "b" within a section is less than 1.0 | ★ | ★ | ★ | ★ | ★ | 4.0 |
| Stain "a" and "b" between sections is less than 1.0 | ★ | ★ | ★ | ★ | ★ | 4.0 |
| Stain "L" within a section is less than 1.0 | ★ | ★ | ★ | ★ | ★ | 3.5 |
| Stain "a" and "b" within a section is less than 1.0 when using different lots of stain | ★ | ★ | ★ | ★ | ★ | 3.5 |
| Stain "a" and "b" color change after 5000 hr is less than Delta E of 3.0 | ★ | ★ | ★ | ★ | ★ | 33.3 |
| FUNCTION | | | | | | |
| No peeling or loss of stain for 10 years (correlated to accelerated aging) | ★ | ★ | ★ | ★ | ★ | 10.9 |
| No re-priming of substrate required after stripping | ★ | ★ | ★ | ★ | ★ | 1.0 |
| Removes topcoat and stain with Gate-Strip | ★ | ★ | ★ | ★ | ★ | 1.0 |
| Removes topcoat and stain with methylene chloride stripper | ★ | ★ | ★ | ★ | ★ | 1.0 |
| MECHANICAL | | | | | | |
| Adhesion is minimum 4B | ★ | ★ | ★ | ★ | ★ | 3.2 |
| No blocking with 100 psi pressure after 15 minutes, heaviest topcoat | ★ | ★ | ★ | ★ | ★ | 2.5 |
| CHEMICAL | | | | | | |
| No bleed-through topcoat | ★ | ★ | ★ | ★ | ★ | 2.0 |
| Stain dries within 2 minutes | ★ | ★ | ★ | ★ | ★ | 2.0 |
| Process or materials use no components listed on HAZMAT list | ★ | ★ | ★ | ★ | ★ | 4.0 |
| Process effluents do not require labeling as Special Handling for land fill | ★ | ★ | ★ | ★ | ★ | 2.7 |
| TCLP Chromatoly maximum: 2-12.5 | ★ | ★ | ★ | ★ | ★ | 6.7 |
| TCLP Flash point minimum: 140F | ★ | ★ | ★ | ★ | ★ | 4.2 |
| TCLP Metals Max: 40CFR268.40 | ★ | ★ | ★ | ★ | ★ | 3.7 |
| TCLP Paint Filter liquid: Pass | ★ | ★ | ★ | ★ | ★ | 3.7 |
| TCLP pH minimum: Pass | ★ | ★ | ★ | ★ | ★ | 3.7 |
| Process or material VOC emissions less than 1 lb/yr | ★ | ★ | ★ | ★ | ★ | 3.5 |
| OTHER | | | | | | |
| Taber staining and topcoat process is less than 320 variable density garage door | ★ | ★ | ★ | ★ | ★ | 3.3 |
| Capital Investment <\$20,000 | ★ | ★ | ★ | ★ | ★ | 7.3 |
| Capacity minimum 550 K (total feet processing/yr) | ★ | ★ | ★ | ★ | ★ | 2.6 |
| Complete initial patent review | ★ | ★ | ★ | ★ | ★ | 3.0 |
| SUM OF PUNTS | | | | | | |
| 1 | 14.4 | 137.0 | 180.0 | 180.0 | 180.0 | 180.0 |
| 2 | 49.2 | 492.0 | 612.0 | 612.0 | 612.0 | 612.0 |
| 3 | 164.0 | 1640.0 | 2016.0 | 2016.0 | 2016.0 | 2016.0 |
| 4 | 528.0 | 5280.0 | 6584.0 | 6584.0 | 6584.0 | 6584.0 |
| 5 | 1744.0 | 17440.0 | 21800.0 | 21800.0 | 21800.0 | 21800.0 |
| CONCEPT SCORE | | | | | | |
| 1 | 14.4 | 137.0 | 180.0 | 180.0 | 180.0 | 180.0 |

RESULTS

The client unveiled their new product line at the IBS as the start of a successful product launch. The award-winning product has been embraced by the market. As a result, the client has requested that Aptimise assist with building additional molds.

KEY ACHIEVEMENTS

- Project completed on time, on budget, and fully meeting client specifications.
- Product readily accepted by market – additional tools ordered.
- Client received nationally recognized award for this innovative product.