

# CAE AIR1 MECHANICAL VENTILATOR:

Rapid Manufacturing with Plastique Art and SEKISUI KYDEX



300 suppliers, 5,000 people, 80,000 thermoplastic parts, and 500,000 pounds of KYDEX® Thermoplastics. CAE was able to deliver 10,000 CAE Air1 mechanical ventilators to aid COVID-19 pandemic relief in Canada, with a dedicated supply chain working at full speed, including Plastique Art and SEKISUI KYDEX.

## CAE AIR1 MECHANICAL VENTILATOR

In April 2020, following the shutdown in response to the COVID-19 pandemic, CAE stepped up to support the relief effort. Canada was calling for the production of 10,000 ventilators. At the time, ventilators were in high demand to support the care and recovery for COVID-19 patients. Historically, CAE was known for producing simulation equipment for the medical and aviation industries, however they transformed their manufacturing model to move into full scale ventilator mass production, a product they had never made before.

Unlike other ventilator projects using existing ventilator designs, CAE opted to engineer and develop a new ventilator, the CAE Air1. Once CAE won the bid for the project, their engineering team set out to develop the CAE Air1 for production. The initial design began as the size of a shoe box and was meant to be a portable unit. The design evolved to become a high-end, intensive care ventilator unit measuring approximately four feet tall. Regardless of size, Plastique Art was up to the challenge of producing the parts required for the machine.

## SECURING THE SUPPLY CHAIN

Plastique Art is a professional thermoformer with over 65 years of experience. With a rigorous deadline, they were positioned to help the CAE team reach their goals. Plastique Art leveraged their in-house tooling development capabilities, experience with vacuum forming, and knowledge of thermoplastics to be successful.

As experts in the field, Plastique Art provided guidance on recommended materials and thermoforming processes. The project required medical grade materials that were durable, chemical resistant, and met the demand of certification from Health Canada. Plastique Art immediately turned to KYDEX® Thermoplastics, knowing they were widely used in within the medical arena.

“When CAE asked us to recommend a material for their new medical device, we didn’t hesitate. Having been thermoforming KYDEX® sheets daily for more than 10 years, we had the expertise and confidence that SEKISUI KYDEX would be there to partner with us in making this a reality,” said Pascal Baillargeon, President and CEO, Plastique Art.



**CAE**

CAE is a high technology company, at the leading edge of digital immersion, providing solutions to make the world a safer place. Their vision is to be the worldwide partner of choice in civil aviation, defense and security, and healthcare by revolutionizing their customers’ training and critical operations with digitally immersive solutions to elevate safety, efficiency and readiness.

Using technical data and material testing information from SEKISUI KYDEX, Plastique Art was able to expedite the material choice with CAE. KYDEX® Thermoplastics are durable, chemical resistant, inherently antimicrobial, and available in a wide range of options for design. Ultimately, Plastique Art determined KYDEX® T was ideal for the project. With material selection in place, it was time to make seven molds, seven CNC fixtures, and produce 500,000 pounds of KYDEX® Thermoplastic sheet.

## PRE-PRODUCTION PLANNING

For the original design of the CAE Air1 ventilator; 3D printing, injection molding, and sheet metal were all considered as material choices for the housing. However, when considering the urgency and volume of the project, Plastique Art knew thermoforming, specifically vacuum forming, was the best solution.

Project timelines need to consider the manufacturing processes for material, tooling, and finished parts. 3D printed parts and sheet metal solutions are labor intensive to fabricate. They also require extensive finishing processes to seal, sand, and paint in order to achieve the same level of aesthetics of thermoplastic material with in-mold color features.



## FULL SCALE PRODUCTION

To achieve the goal of making 10,000 certified units in three months, production had to be scaled to maximum capacity. Plastique Art recently invested in a new thermoformer and expanded their shifts to include weekends for two months. This enabled them to meet the goal of parts for 1,100 units per week.

“We were ready for the challenge. Our team and everyone in the supply chain took the project seriously. We stand by our commitment to deliver what we say we will do. We do that by understanding our customers and what they are trying to achieve,” said Pascal Baillargeon, President and CEO, Plastique Art.

Using SEKISUI KYDEX’s Quick Response Manufacturing Model, 50,000 pounds of KYDEX® Thermoplastics were delivered every week to Plastique Art. The standard lead time of four weeks for material was expedited to one week. The volume of KYDEX® Thermoplastics was so high, Plastique Art had to secure additional warehouse space to house the pallets of material.



Vacuum forming, especially when using KYDEX® Thermoplastic sheet, allows for shorter lead times to have material on hand for processing, shortening the production time for parts. Tools can be turned around in under two weeks, while pressure forming tools may take four to six. Once the sheet is formed, it only requires trimming and minimal assembly time for final installation.

Final CAD files were received on April 20, and by April 30, Plastique Art finished parts for 11 CAE Air1 prototypes that were production ready. Plastique Art’s experience and capabilities in creating production ready RenShape molds ensured they were quickly able to make parts for 300 units that would be used for the certification of Health Canada.

Final adjustments for the design were made through May. By June 16, the CAE Air1 ventilator was in its first round of certifications. By August 14, the second round of certifications was completed. On August 17, just 142 days since the start of the project, mass production was under way. Under normal conditions, the average time for a medical device from conception to production typically takes at least 18 months.



**PLASTIQUE ART**

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Plastique Art specializes in the manufacturing of customized plastic components. With 65 years of expertise in thermoforming, the company has earned a reputation as a leader in the plastics industry. Its mission: provide its customers with solutions optimized to their specifications and needs all while aiming to balance features, design, costs, and deadlines. To do so, Plastique Art makes a point of accompanying clients from the parts’ development up to the delivery of the final product. Their experienced and innovative team takes deadlines very seriously and will quickly adapt to customer needs. Certified ISO 9001, the company is committed to innovation and continuous improvement.





“We are really thankful and grateful for all of the work the KYDEX® team put in to make our project successful. Expediting the material with late notice helped us to meet our goals. We look forward to working with them through our direct suppliers again,” said Ayman Eid, Category and Vendor Manager, CAE. SEKISUI KYDEX was committed to helping Plastique Art and CAE reach their deadline.

“It was a privilege to work with Plastique Art and CAE on this important application, and our team was excited to provide whatever support was needed. CAE and Plastique Art are real-life heroes for making this happen, from concept to fulfillment, in a ridiculously fast time, which ultimately saved people’s lives,” said Mark Denning, Medical Market Business Manager, SEKISUI KYDEX.

Thanks to a dedicated supply chain working together to make this project a success, the last of the CAE Air1 ventilators were completed in December 2020.

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## LEARN MORE:

PLASTIQUE ART 

[plastiqueart.com](http://plastiqueart.com)

CAE 

[cae.com](http://cae.com)

SEKISUI KYDEX 

[kydex.com](http://kydex.com)

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**KYDEX®**  
THERMOPLASTICS

KYDEX® Thermoplastics are best known as specialized polymers manufactured with incredibly short lead times in industry-leading small production batches. Using the Quick Response Manufacturing (QRM) model to support the bespoke nature of new customer demands, SEKISUI KYDEX manufactures exactly what their customers want in the time and quantities that help them rapidly innovate and grow. KYDEX® Thermoplastics serve as sustainable solutions to alternative materials, ensuring a better environment for future generations.



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