Case Study
Saeplast

NOVA Chemicals®

Driving Business Success Through New Materials

Achieving Key Business Drivers and Improving Sustainability with Collaboration

saeplast®

A part of rotovia

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NOVA Chemicals and Saeplast Americas have collaborated on rotomolding projects for several years. Both companies strive to develop more sustainable packaging and achieve a circular economy for plastics. Through their synergistic and innovative projects, their goals of sustainability are becoming a reality.

NOVA Chemicals, a producer of polyethylene and recycled polyethylene recently began a new endeavor with Saeplast to increase operational efficiency and sustainability. Saeplast, a subsidiary of Rotovia, has a strong history in Atlantic Canada dating back over40 years, providing rotomolded solutions to the fish and meat markets in the form of insulated containers. The company has been under the leadership of Brian Gooding (Managing Director) since July 2011 supported by his all-star team. Rotovia was formed by a management led buy of the rotational molding business from a large international packaging firm. Rotovia has a large global presence in the rotational molding industry with ten manufacturing facilities in 7 countries. They utilize their expertise in the rotomolding process to produce sustainable plastic products that are used globally across the agriculture, commercial vehicles, renewable energy, leisure, chemical and food markets.

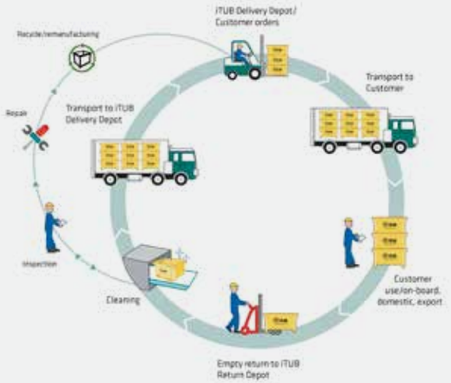
“Our rotomolded products are already inherently sustainable but as an organization we are striving to do more development in the circular economy and building a sustainable business model” says Gooding. “We believe in collaborative partnerships and that’s what we get when working with NOVA Chemicals”.

A good example of sustainability at Saeplast is the iTUB rental in Northern Europe. iTUB rents Saeplast equipment in a circular pooling system. This business unit epitomizes the very essence of sustainability. The products are durable and last for many years if not decades. Additionally, iTUB controls the product through multiple rental depots, creating the opportunity to inspect inventory. Retaining this control puts the company in a position to conduct product maintenance as container degradation from normal wear and tear is seen, thus extended the product life expectancy. iTUB´s Saeplast products are used countless times during their lifetime, and it’s unfathomable to think about the amount of disposable packaging our iTUB containers would replace.

At its current stage, Saeplast is developing a take-back service to reprocess bins and generate a next-generation product. It will use post-consumer reprocessed polyethylene and feed it back into the core of new containers for iTUB. This is circularity as it’s intended and something we are very proud of within Rotovia and Saeplast.

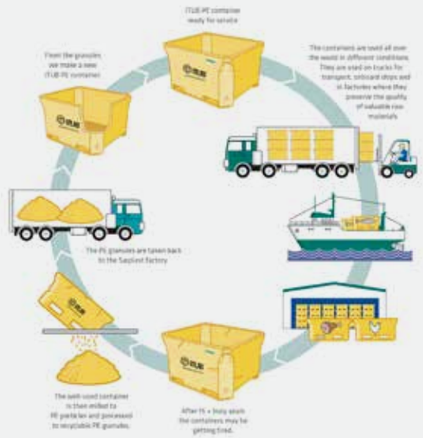
SUSTAINABLE BUSINESS MODEL

Reuse and Share
Circular economy



Strong Product Identification needed

Recycle and Remanufacture
100% Recycling



Evaluating needs and opportunities

NOVA Chemicals and Saeplast have always enjoyed a collaborative technical relationship that was originally fostered by retired Rotomolding Technical Service expert, Henry Hay, who has since passed the torch to Dustin Turgeon, Professional Engineer and Technical Service Specialist. “I was really eager to work with the Saeplast team,” says Turgeon. “Saeplast already had been using TRx0338 when I came in, but I knew that if Brian took advantage of its exceptional performance, it could not only improve their bottom line but also help them down their sustainability path.”

The relationship began gaining momentum when NOVA Chemicals commercialized its new portfolio of hexene rotational molding polyethylene, NOVAPOL® TRx resin. Hay collaborated with Saeplast and began discussions on how to optimize the physical properties of their insulated containers and explore the processing benefits of the NOVAPOL® TRx0338-U(UG) resin.

As a material supplier, it is critical that NOVA Chemicals understands what customers need to be successful. Through many engagements with expert rotomolders, such as Gooding and his team at Saeplast, it was clear that all the key business drivers support the larger picture of improving sustainability in products that are already inherently sustainable. Namely, improving cycle time, operational flexibility, energy savings, and the potential to lightweight.

The NOVAPOL® TRx0338-U(UG) resin, a hexene linear low polyethylene that was designed to have unprecedented productivity, part performance, and designed to support the key business drivers in the roto industry. NOVA Chemicals and Saeplast explored the practical benefits of the TRx0338-U(UG) material from a rotomolding process and part lightweighting potential.

- Faster Cycle Time
- Broader Processing Window
- Improved Energy Savings
- Better Impact Performance

- ✔ More throughput per machine (unlocking capacity without capital spends)
- ✔ More stable parts with higher impact & less scrap from improved cure
- ✔ Operational flexibility and resin consolidation from a broader process window
- ✔ Less energy consumption and reduced carbon footprint from lower oven temperatures
- ✔ Lightweighting potential from improved impacts

Testing Methods

NOVA Chemicals and Saeplast teams developed a testing plan to quantify and expand the benefits that Saeplast had already been experiencing with the TRx material. The team decided to use the D660 double walled stackable insulated container as the part for the testing. This is a Saeplast legacy core product that is strong, dependable, and well suited for the seafood industry.

Product Parameters:

- ✔ Standard weight: 48 kg / 106 lb.
- ✔ Volume: 643.5 L / 170 gallons

A series of in-field and lab testing was conducted to compare the NOVAPOL® TRx0338-U(UG) resin against a conventional 3 MI hexene roto resin. The primary quantitative test conducted was the Cold Temperature ARM Impact testing with the pass criteria of ARM ductile failures occurring in greater than 50% of the samples at a temperature of minus 40°C. The impact testing was conducted on the inside and outside walls of the container. Additionally, when examining lightweighting potential, side-wall stiffness deflection testing was completed, and qualitative testing was conducted to examine the level of cure (side wall bubbles present or signs of overcuring) and physical appearance.

PROVING PERFORMANCE

Processing

The first processing benefit explored was to improve cycle time. The approach was simple. Using parts made from NOVAPOL TRx0338 resins, the Saeplast team reduced the cycle time by 1 minute at a time until a 12% reduction was achieved, after which the parts were taken away for testing. The results spoke for themselves: The parts had a perfect level of cure and equivalent physical appearance, and all parts passed the impact testing. These results proved that there was room for further reductions in cycle time.

Figure 1: Side Wall Bubble Free - Perfect Cure at 12% cycle time reduction

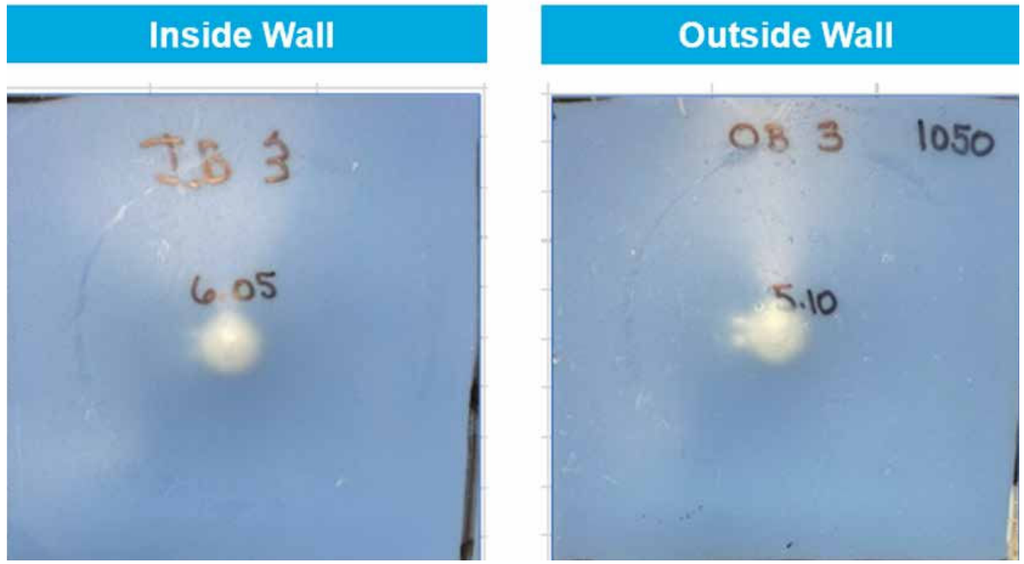
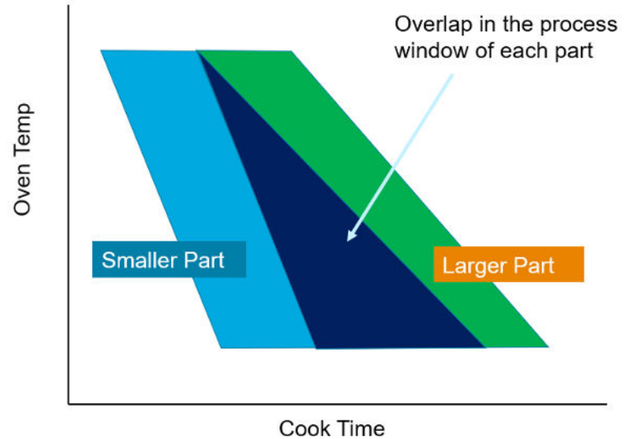


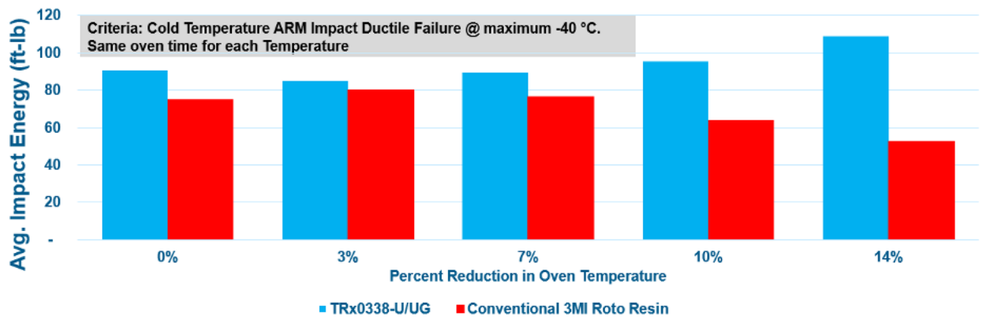
Figure 2: Samples from the impact testing at 12% cycle time reduction

Operational flexibility is the ability to run different, new, and/or unique tooling combinations on the same machine arm and the same process conditions while still producing quality parts. One notable example of Saeplast's success is their ability to run the D660 insulated container with their D1000 container. There is a 76% difference in part weight, preventing Saeplast from previously running this tooling combination. By running unique tooling combinations, Saeplast has been able to unlock capital free capacity and reduce energy usage by optimizing production runs to fit their orders.

What makes this operational flexibility possible? The answer is the material's (like the TRx0338) ability to achieve an optimal level of cure at a wide range of oven times and temperatures, which we call the process window. When molding parts of varied sizes, shapes, or thicknesses, molders can find the process window for each part and then compare them to find where they overlap. An example is shown in the diagram to the right. By using a material that has a broad processing window, there is more opportunity for overlap, increasing operational flexibility.



The final processing benefit explored was lowering the oven temperatures to reduce energy consumption. D660 containers were molded using NOVAPOL® TRx0338 resin and with a conventional 3 MI hexene roto resin while reducing oven temperatures. The average impact energy for each part was found from the cold temperature ARM Impact testing. Seen in the diagram below, as we lowered the oven temperature (as much as 14%), the TRx0338 was able to maintain the average impact toughness without changing cook time. Our testing showed that even after a 14% reduction there was still room to continue decreasing the oven temperatures even further.

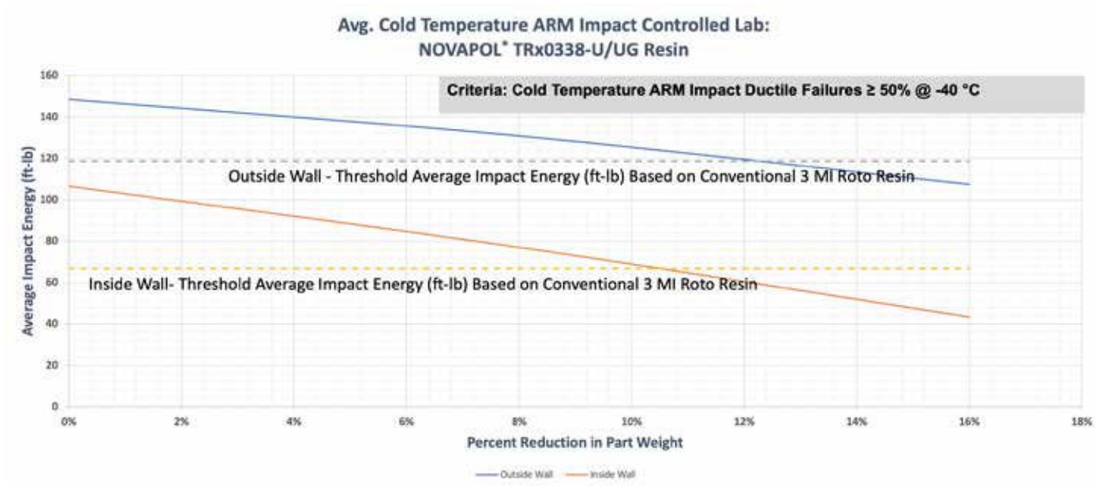


By working collaboratively with NOVA using the TRx resins, Saeplast is finding new and unique ways to optimize operations and deliver value to customers. A direct link can be made between the processing benefits and the goal of making rigid durable parts even more sustainable.

PROVING PERFORMANCE

Lightweighting Potential

The obvious benefits of lightweighting mean alot to Saeplast, but there is no “one size fits all”. The insulated containers are built to last, and the ability to withstand the impacts of a physically demanding industry is paramount. Therefore, we used cold temperature ARM impact testing as our failure criteria. Saeplast has years of field experience and experimental data that we used to determine our required impact energy for our lightweighting experiment. The team at Saeplast molded the D660 containers using the NOVAPOL® TRx0338 resin and reduced the shot weight in stages until there was a 15% reduction. The inside and outside walls were shipped to the labs at NOVA Chemicals’ Centre for Performance Applications (CPA) for testing. The below results show that Saeplast could light weight up to 10% while staying above the threshold impact toughness.



Whenever undertaking a lightweighting initiative, it is important to understand the trade-off between wall thickness (shot weight) and side wall stiffness. The initial lab testing focused only on the polyethylene solid side walls and not on the composite sandwich structure (side wall plus foam insulation). Therefore, further collaboration is needed to perform in-field and lab stiffness testing on the full part and composite sandwich structure. The following testing was conducted at NOVA Chemicals’ CPA to understand the effect reducing the shot weight has on the individual inside and outside wall stiffness. Each side wall was bent on an Instron testing machine and the force required to deflect the side wall by one inch was measured. The teams at NOVA Chemicals and Saeplast believe that the reduction in stiffness will be significantly less when testing the whole composite sandwich structure and part. Initial calculations by the Rotovia team suggest when lightweighting the polyethylene side walls the stiffness reduction in the composite will be significantly less when compared to only testing the individual side walls. Therefore, further testing will be conducted to verify if this reduction of stiffness will be a challenge in practice.

SUSTAINABILITY

Putting it All Together

When we start to think broadly and put the benefits together, the teams at Saeplast and NOVA Chemicals are looking at new and innovative ways to improve the efficiency and sustainability of Saeplast’s operations. We are looking beyond the obvious benefits of reducing the environmental footprint in products that are already inherently sustainable and essential to the value chain of our global meat and seafood industries. We strive to explore new ways of building a sustainable and circular business model by utilizing strategic opportunities where we can employ NOVAPOL® TRx0338-U resins to further optimize the production of insulated containers.

Trademarks

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