Case Study
TRx Natural Gas Savings

NOVA Chemicals®

NOVA Chemicals has introduced a next-generation product to the rotational molding market: TRx

FLEXAHOPPER PLASTICS LTD
CELEBRATING OVER 50 YEARS IN BUSINESS

NOVAPOL® TRx resins were designed to provide molders with a range of options to help their business, including: unprecedented productivity, broader operational flexibility, improved part performance, reduced scrap rates, and significantly lower energy use and costs for rotomolders.

This case study presents the highlights and advantages of TRx grades, including substantial natural gas savings achieved through one or a combination of **cycle time reduction, reduced oven temperatures, and increased productivity.**

The findings will be presented in two parts:

- **Part 1:** NOVA's controlled laboratory testing, which demonstrates the various combinations that molders can use to achieve energy savings and/or increased productivity.

- **Part 2:** Real-world manufacturing trials with Flexahopper, illustrating the practical and impactful applications of TRx, made possible by its game-changing ability to reach cure at unprecedented low temperatures.

Adriana Mercader
CEO, Flexahopper Plastics

Dave Sullivan
Specialist, Technical Service

“ Before running TRx, I would have never believed parts could be cured at such low Peak Internal Air Temperatures.”

Felipe Guerra, Flexahopper

Evaluating Needs and Opportunities

Flexahopper Plastics Ltd., a 100% Canadian-owned rotational molding company founded in 1967 and headquartered in Lethbridge, Alberta, has a strong history in rotational molding. They provide rotomolded solutions across industries such as food processing, liquid handling, farming, material handling, custom products, and oil & gas. Committed to sustainability, Flexahopper operates the largest solar array in the industry, consisting of 508 solar panels producing over 212 MWh of power annually. Since 2007, they have also chosen renewable energy through Bullfrog Power, Canada’s leading green energy provider.

Felipe Guerra, Flexahopper’s Strategic Initiative Director and Industrial Engineer, worked with Dave Sullivan, Technical Service Specialist at NOVA Chemicals, to generate real manufacturing data that substantiates TRx’s ability to shift production into a space previously unachievable based on traditional rotational molding “textbook” teachings. This case study demonstrates how TRx enables parts to be produced with peak internal air temperatures (PIAT) of approximately 320°F, compared to traditional materials that require temperatures above 375°F. These lower cooking temperatures permit substantial savings in production time and energy consumption — less natural gas and more parts per day.

NOVA collaborated with Flexahopper to showcase the energy-saving benefits of TRx rotational molding grades. Both companies strive to develop more sustainable plastic products that enable a circular economy for plastics, making this collaboration a natural fit. TRx aligns with Flexahopper’s goal of reducing their carbon footprint and being a sustainability champion in the rotational molding industry by minimizing the amount of natural gas required to manufacture parts.

By leveraging their combined expertise, NOVA Chemicals and Flexahopper have explored and implemented the energy-saving potential of TRx grades through collaborative efforts. This partnership highlights how innovative materials can support more sustainable manufacturing practices while delivering significant cost savings to the molder’s business.

Lower Temps and Faster Cycles

We ran tests using six 8-pound cubes with 1/4” wall thickness to demonstrate how TRx can make your work more efficient.

Here’s what we focused on:

- Shorter Cycle Times: TRx helps you get parts out of the oven faster.
- Lower Oven Temperatures: You can run your ovens at lower heat, saving energy and costs.

We compared TRx to the standard material in two ways:

- Matching Production: Making the same number of parts per day as the incumbent material (13 runs) but using less energy.
- Maximizing Output: Producing as many parts as possible in an 8-hour shift compared to the standard material.

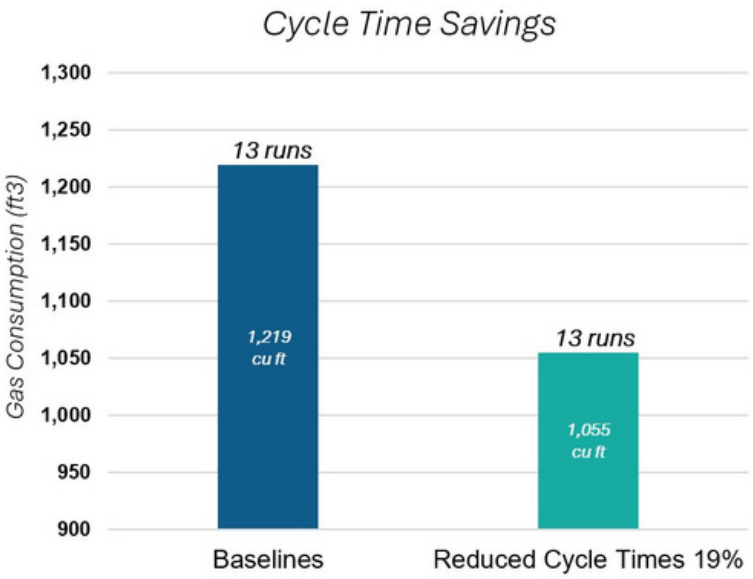
Proving Performance - Matching Production

Part 1: NOVA Laboratory Controlled Roto Study

CYCLE TIME REDUCTION

8-Hour Shift:

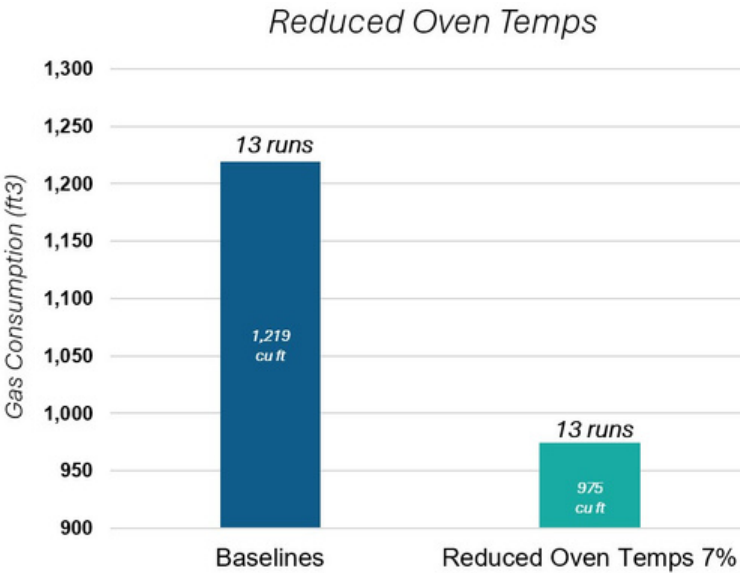
- **Baseline:** 13 runs, 1,219 cubic feet of natural gas.
- Relative natural gas savings per shift: 13.5%.



REDUCED OVEN TEMPERATURES

8-Hour Shift:

- **Baseline**: 13 runs,1,219 cubic feet of natural gas.
- Relative savings per shift: 20%.



Savings to Molder

- per part saving: 0.6 %
- per lb saving: ~1 ccp

Savings to Molder

- per part saving: 1.0 %
- per lb saving: ~1 ccp

What Does This Data Show?

Maintaining the same number of runs per shift, natural gas savings could range from 13.5% to 20%, depending on the priority — shorter cycle times or lower oven temperatures.

Natural Gas Savings

In this portion of the study, we assessed the number of parts made during an 8-hour shift while maintaining cure quality and minimizing natural gas use.

We measured cycle completion and gas consumption, with the baseline material yielding 13 runs at gas consumption of 1,219 cubic feet.

8-Hour Shift:

Baseline (Traditional Resin):

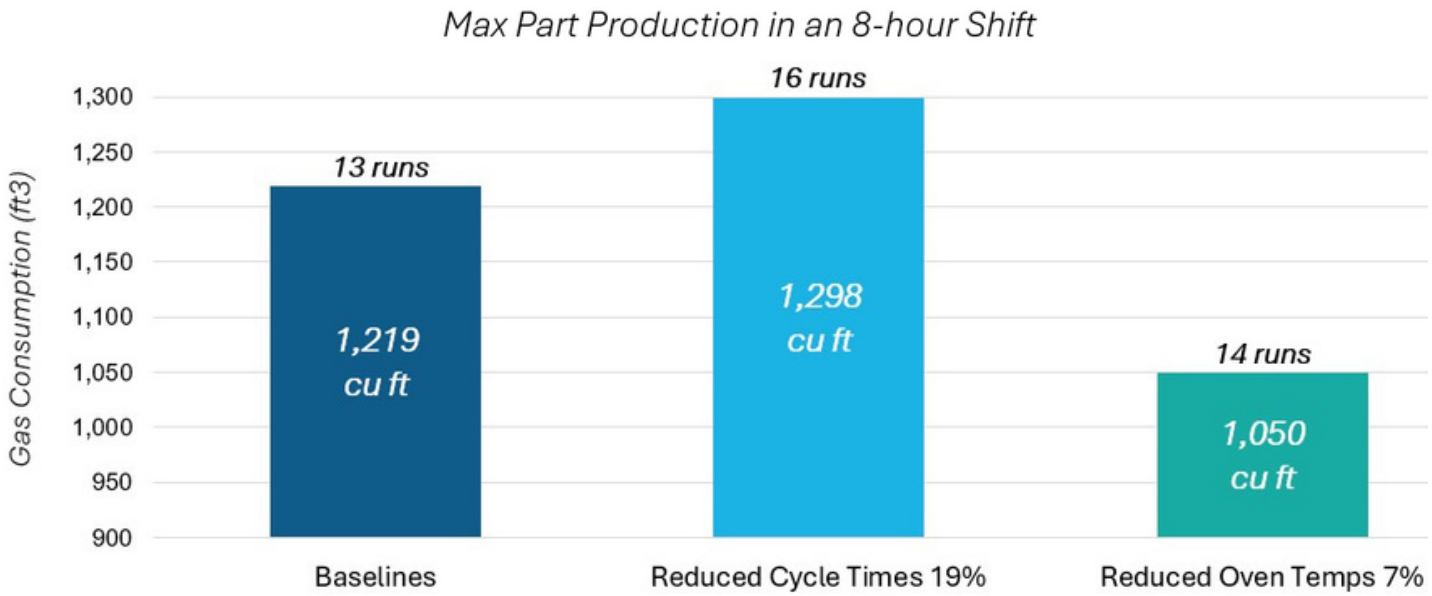
- 13 runs using 1,219 cubic feet of natural gas

With Shorter Cycle Times (TRx):

- 16 runs using 1,298 cubic feet of natural gas
- 13.48% gas savings per run compared to the baseline

With Lower Oven Temperatures (TRx):

- 14 runs using 1,050 cubic feet of natural gas
- 20.02% gas savings per run compared to the baseline



What Does This Data Show?

TRx offers flexibility, allowing you to prioritize part production or energy savings while maintaining product quality.

NOTE ON FINANCIAL IMPLICATIONS: *Hypothetical annual savings based on a rotational molding business running 1.24MM lbs of PE annually. Producing 50,000 parts weighing 7 lbs each per year.*

Part 2: Real-world Manufacturing Trials with Flexahopper

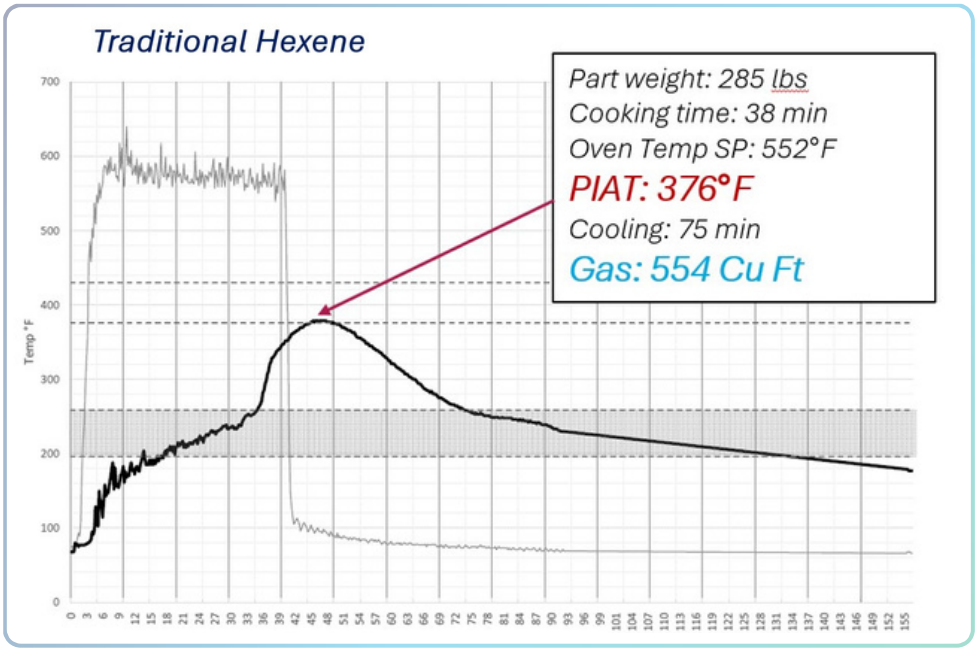
Achieving significant reductions in natural gas consumption while also:

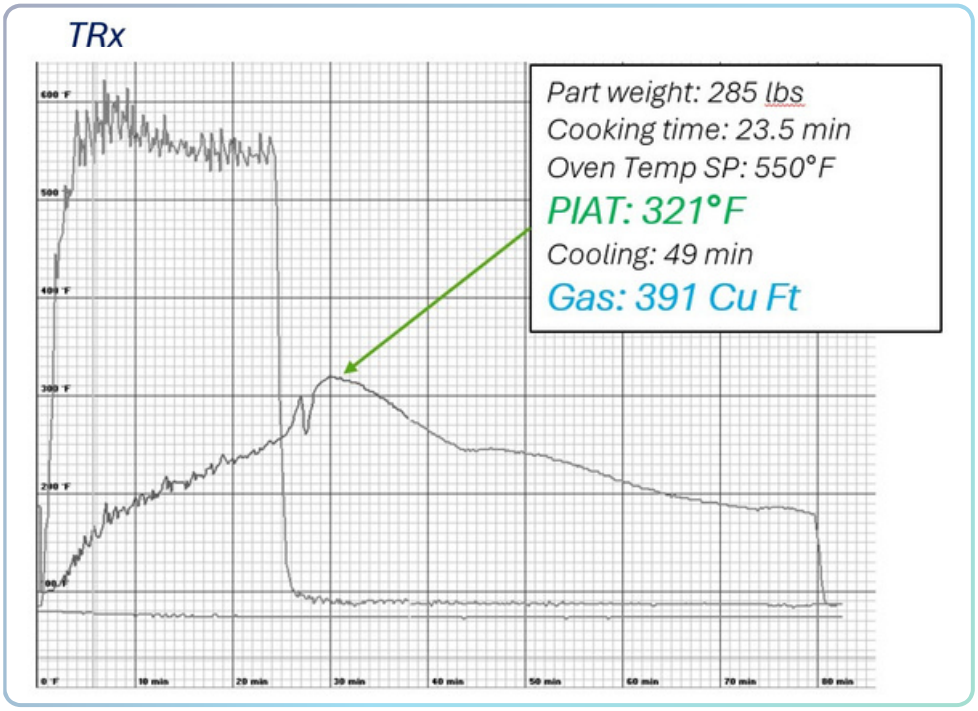
- Increasing output while maintaining part quality
- Achieving proper cure at lower peak internal air temperature (PIAT)

These thick-walled tanks were produced with both TRx and traditional hexene resins. Highlights include:

- **Parts Made:** Photos of the molded 285-lb thick-walled tanks with a 3/8” wall thickness
- **Temperature Comparison:** Side-by-side Peak Internal Air Temperature (PIAT) plots
- **Cure Assessment:** Microscopic images of sidewalls showing bubble formation at specific PIATs for both materials.
- **Process Data Comparison:** A breakdown of cook times, oven temperatures, cooling times, and achieved PIAT for TRx vs. traditional hexene material.

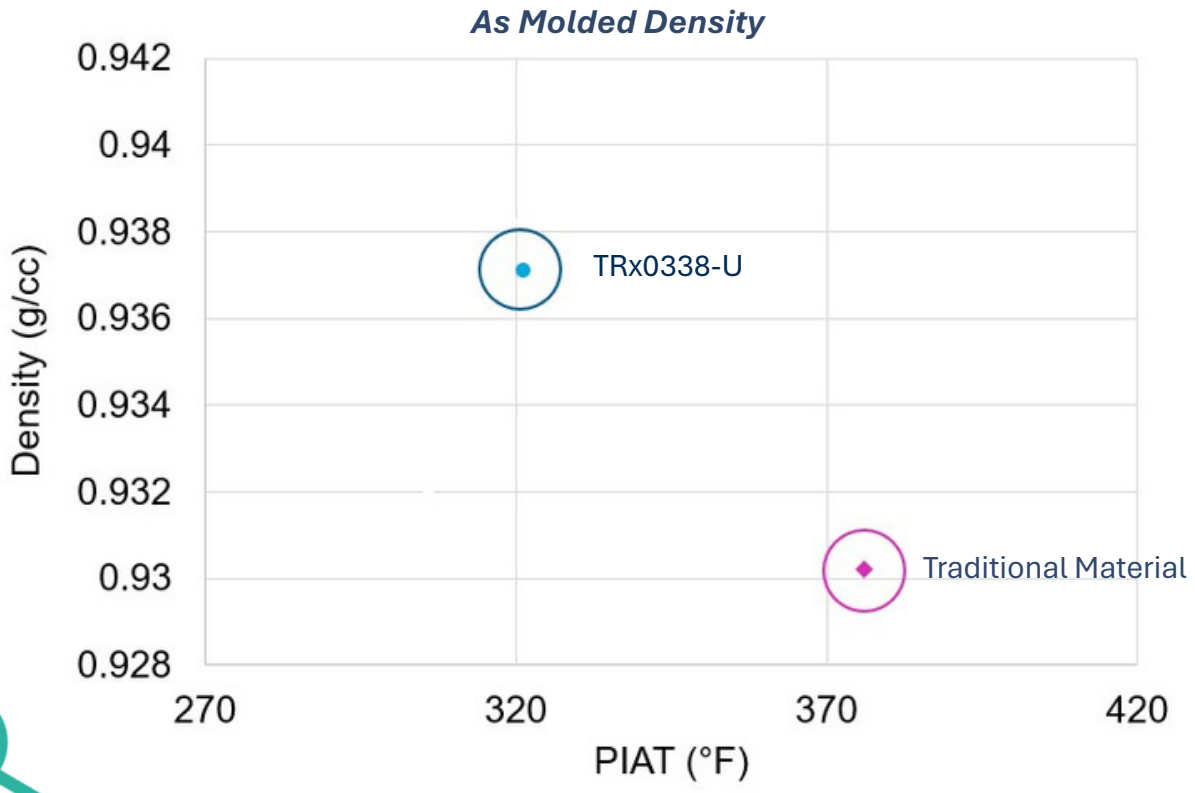
TRx was evaluated not only for its ability to reduce energy consumption and increase productivity, but also for its capacity to produce an equivalently cured part under the lower internal air temperature conditions.





What Does This Data Show?

Comparison of Peak Internal Air Temperatures (PIAT) measurements demonstrates TRx required a 55°F decrease in PIAT compared to traditional hexene roto material to achieve an equivalent cure state. This cure equivalency was confirmed through field evaluations using a light loupe on sidewall cutouts looking at bubbles. The PIAT data shows TRx achieves proper cure with significantly less energy input then the traditional hexene resin.

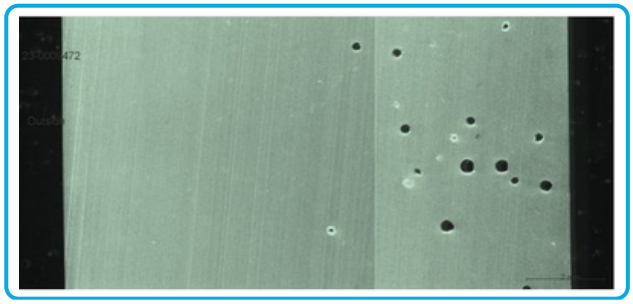


What Does This Data Show?

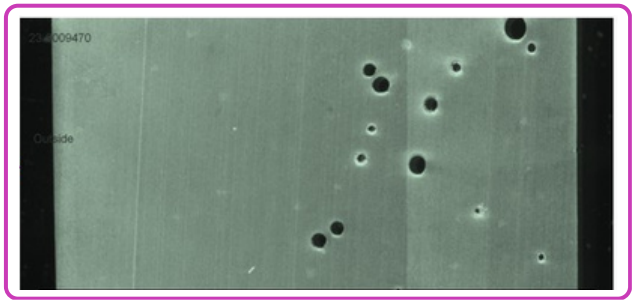
As-molded density (g/cc) was measured to confirm TRx parts achieved optimal cure, maintaining values at or above 0.938 g/cc at lower PIAT conditions.

The traditional hexene, with the same target density, had as-molded density of approximately 0.930 g/cc. (0.008 g/cc lower as-molded density - indicates under cured part).

TRx0338-U



Traditional Material



Sidewall Bubbles via sidewall microscopy

What Does This Data Show?

Fewer sidewall bubbles indicate better cure, with TRx showing equivalent bubbles at a lower PIAT values than the traditional material.

Representative Process Data:

Material	*Condition*	*Shot Weight (lbs)*	*Cook Time (min)*	*Oven Temp (°F)*	*Cool Time (min)*	*PIAT (°F)*
Traditional hexene	**Baseline**	**285**	**38**	**552**	**75**	**376**
TRx0338-U	**Reduce Oven T**	**285**	**38**	**500**	**60**	**326**
TRx0338-U	**Reduce Cycle T**	**285**	**23.5**	**550**	**49**	**321**

The table provides manufacturing conditions (oven temperature, cycle time, cooling time, and PIAT) to compare TRx and traditional hexene materials. This information can be used to help the reader visualize process condition combinations.

When focused on **energy savings**, TRx achieved lower PIAT (326°F vs. 376°F) at reduced oven temperatures (552°F to 500°F).

When focused on **cycle time savings**, TRx lowered PIAT to 321°F (at some oven temperatures) while cutting cook times from 38 to 23.5 minutes and cooling time from 75 to 49 minutes.

Note that cooling times are longer than what Flexahopper typically uses, as this trial only used forced air cooling with no water cooling. The thick-walled tanks are thick-walled 3/8” parts, and as is well known in the rotomolding industry, thicker parts can be sensitive to warpage when using faster cooling. To avoid this risk while adjusting process parameters, we used air-only cooling.

Cooling times could be further reduced if water misting or a deluge cooling step were introduced. These results confirm and demonstrate TRx’s versatility in improving both energy efficiency and productivity across different operating conditions.

Key Takeaways

Commercial scale trials confirmed the smaller scale lab findings and show how TRx delivers energy savings, productivity gains while maintaining part quality.

Energy Savings

Reduced Natural Gas Usage: TRx reduced natural gas usage by 30% per part, translating to lower production costs and a smaller carbon footprint. Natural gas consumption dropped from 554 cubic feet thick-walled tanks (traditional resin) to 391 cubic feet thick-walled tanks when using TRx.

Increased Productivity

Shorter Cook Times: By cutting cook times by 30%, TRx allowed manufacturers to produce more parts in the same timeframe without compromising quality.

Faster Cooling Times

Because TRx achieves cure at lower temperatures, cooling times were substantially reduced, in addition to the shorter cook times. Cooling times decreased by 20% to 35%, further improving overall production efficiency.

Maintained Product Quality

Equivalent Cure: Even at significantly lower PIATs (321°F vs. 376°F; 55°F lower), TRx achieved proper cure, as confirmed by as-molded density measurements and sidewall bubble comparisons.

This case study highlights that the energy savings and efficiency benefits of TRx include small parts as well as larger parts, making it an effective and sustainable solution for all Rotomolders.

Conclusion

NOVA Chemicals' NOVAPOL TRx resins provide compelling solutions for improving energy efficiency, reducing costs, and enhancing productivity. The collaboration with Flexahopper demonstrates the practical applications of TRx rotational molding grades, showcasing their ability to deliver substantial savings and operational benefits in real-world manufacturing environments.

By leveraging these advancements, customers can achieve their sustainability and efficiency goals without compromising performance.

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