



**MILACRON®**

DECEMBER 2020

**How Milacron provided a new BARR  
VBET screw leading HARBEC to recoup  
18% scrap and significant cost savings**



## HIGHLIGHTS

### CHALLENGE

- Processing issues can be amplified when working with difficult materials or processes.
- This may take additional efforts to perfect it in practice.
- Process concerns did not align with sustainability initiatives and expectations of processing solutions.

### SOLUTION

- Milacron and HARBEC worked to diagnose issues and evaluate potential solutions.
- Agreement made to attempt combatting errors with a BARR VBET screw trial.
- Milacron delivered customized screw solution.

### RESULTS

- Improved mixing, scrap rate decreased by 18%
- Material Savings, \$324.20 per day
- Labor Cost Reductions, \$111.72 per day
- Total production cost savings estimated around \$109,289.72 per year.

## MARKET SEGMENT

Highly Toleranced - Aerospace, Medical and Industrial

## ABOUT HARBEC

HARBEC is an AS9100 and ISO13485 certified and ITAR registered contract manufacturer of tight tolerance precision 3D printed metals and plastics, machined components and assemblies, and injection molded components and assemblies. HARBEC was established in 1977 as a contract Tool and Die/general machine shop. Its founder, Bob Bechtold, understood that opportunities existed in that market for innovative solutions and problem-solving.

For more than four decades, HARBEC has been a molder of choice for a diversity of customers representing aerospace & defense, medical devices, and diversified industrial markets. Today its machinery fleet consists of 27 molding machines, including 17 Fanuc Roboshot molding machines ranging in size from 55 to 385 US tons inside a 60,000 sq. ft. facility located in Ontario, New York. Milacron has been a partner for HARBEC's custom injection molding operations for nearly three decades.

HARBEC is certified as an ITAR, AS9100 D, ISO13485:2016, ISO9001-2015, ISO14001, and ISO50001/SEP company, and is verified as a Service-Disabled Veteran-Owned Small Business (SDVOSB). It is known for demonstrating its use of "eco-economic" decisions and policies designed to ensure that its activities are sustainable.

HARBEC has developed and implemented technical and process solutions to offset emissions, utilize waste and conserve resources. HARBEC reached its goal of "no carbon footprint" in 2013.

Currently, the facility has 250kW and 850kW wind turbines and operates an eighteen microturbine combined heat and power plant which generates electricity and provides thermal energy to meet the heating and cooling requirements of the facility.

## THE CHALLENGE

With injection molding, there's a lot of room for expensive errors involving safety, performance and function of the product. Combatting flaws in the process can become difficult when speed and quality are both required. For various market sectors, including aerospace & defense, medical, and industrial markets, these issues are amplified, as precise parameters and standards cannot be compromised.

Complex processes including conformal cooling or use of additives<sup>1</sup> have become the norm for many manufacturers, including HARBEC, to meet or exceed product standards. In this process, operators were utilizing a highly engineered Thermoplastic polyurethane (TPU)<sup>2</sup> resin.

Milacron's mission is to discover and provide breakthrough solutions designed with our customers' operations in mind. Often decades of experienced associates work together to predict molding or processing defects before delivering any solutions, occasionally trial and error is needed to perfect it in practice.

For HARBEC, their team had concerns after encountering heavy scrap rates<sup>3</sup> and a loss of a process window due to extreme demand on the screw motor resulting in machine faults, bubbling, burns, voids and splay, alongside excessive cycle times for the application. Not only did these concerns not align with HARBEC's sustainability initiatives and business expectations, Milacron's team was compelled to troubleshoot and discover a remedy for this specific process and later, exceed emerging needs for further production capacity for processes of this caliber.

1. Additive - A substance compounded into a resin to enhance or improve certain characteristics.
2. Thermoplastic polyurethane (TPU) - is a block copolymer consisting of alternating sequences of hard and soft segments capable of providing many combinations such as durability or flexibility.
3. Scrap Rates - the difference in weight between how much plastic you buy in, and the total weight of parts delivered.

## THE SOLUTION

HARBEC contacted Milacron regarding some distinct issues involved in the processing of a TPU, which resulted in excessive scrap rates and machine screw motor torque issues. With the initial contact, Mark Kelly, Aftermarket Sales Engineer, Ryan Paszkowski, machine sales engineer and Ritch Waterfield, Manager of Application Solutions for Milacron Aftermarket, had a conference call with HARBEC leadership and operations team to understand and discuss the issues, and evaluate potential solutions.

Based on a combined 64 years of experience and troubleshooting, Ritch and Mark offered the BARR Variable Barrier Energy Transfer (VBET) design screw to mitigate both the motor torque issue and steep scrap rates. Given HARBEC had no experience with the VBET design, their team approached with skepticism and Milacron agreed to grant a screw trial.

The BARR VBET screw is available only from Milacron Aftermarket and is regularly proposed for the most demanding applications. Milacron's team customized this solution to produce a better melt and mix, lowering shear<sup>4</sup> rates to reduce torque and energy requirements, and consequently providing significant processing and rheology<sup>5</sup> advances. What's unique about the BARR VBET screw is that, by design, it employs conductive melting, thus reducing the shear required by most designs and yielding significantly higher melting rates over that of the conventional screw.

“*The primary reason for using a VBET screw in this application was due to the lower shear of this design. The VBET screw utilizes conductive melting that is initiated from the very aggressive mixing action that occurs as the resin passes through the VBET section. In addition to the conductive melting and lower shear, this mixing action also provides for a very uniform melt temperature across the gradient of the shot, and therefore provides for a more uniform fill. Proper screw design is often the key to optimizing a challenging injection process. The VBET is a proven design that I've found can be optimized to meet many of the injection molding challenges we face today.*

**Ritch Waterfield - Manager of Application Solutions, Milacron Aftermarket**

Extrusion, injection molding, and blow molding equipment all use plasticizing screws. Every resin family has different requirements for the screws that can be used to process it, as all processing equipment for thermoplastics use some form of a plasticizing screw device. The design of the screw is very important to the satisfactory performance of the processing equipment. A properly designed screw will process the resin and yield a more uniform and homogeneous melt and mix in the proper temperature range, without over shearing the resin and causing degradation.

Additional screw varieties and coating options may be considered for other processes. Milacron Servtek provides solutions through critical evaluations in order to provide recommendations and process improvements. For this instance, immediate benefits were discovered for HARBEC.

## THE RESULT

The addition of the BARR VBET screw assembly allowed HARBEC to increase productivity and quality for its customers. HARBEC chose to purchase this screw following the trial and is working to implement this type of variable plasticizing screw across its machinery fleet after discovering numerous benefits.

**Total reductions in production costs from implementing the BARR screw can be estimated around **\$109,289.72** for a single year.**

\*Estimated from 250 working days a year. Full breakdown on page 3.

4. Shearing - occurs throughout the process and, done correctly, makes for successful molding. Done incorrectly, it can lead to resin degradation, part failure, poor cosmetics, and excessive mold corrosion, among other things.

5. Rheology - the branch of physics that deals with the deformation and flow of matter, especially the non-Newtonian flow of liquids and the plastic flow of solids.

## PRODUCTION COST SAVINGS

AVERAGE OLD COST PER DAY

**\$800.90**

SCRAP RATE

**↓18%**

CARBON ENERGY SAVINGS

**\$1.24**

\*Converted from material savings, more efficient process, less run time to accomplish same number of parts.

AVERAGE NEW COST PER DAY

**\$363.75**

MATERIAL SAVINGS

**\$324.20**

LABOR COST REDUCTIONS

**\$111.72**

\*\$65.69 Machine Labor and Burden  
\*\$32.65 Re grind Labor and Burden  
\*\$13.38 Inspection labor

In addition to the quantified successes, Milacron and HARBEC are thrilled with the parts resulting from the upgraded processes. The new scrap rate aligns better with HARBEC's eco-economical strategy to be environmentally responsible and it is able to confidently deliver quality processing for its customers.

“*The work Milacron and their team has done really reinforces the concepts of scientific molding and I'm happy to also show the benefits to our customers and our employees. Knowledge is power, this is the kind of movement and expertise needed in this industry to strive for more efficient processes and overall success, Thank You Milacron!*”

**Matthew Dawes, Engineering Manager, HARBEC**

HARBEC plans to implement additional BARR VBET screws in their machinery fleet to discover additional improvements for other applications. Milacron is pleased to leverage the strength of its people, deep industry expertise and commitment to quality to drive success of customers, including HARBEC, who has a longstanding history of partnering with Milacron.

With numerous improvements and customer successes HARBEC is now working towards a 30,000-square foot upgrade to their facility in Ontario to be completed in March 2021 and is on track to be completely equipped with machinery and upgraded automation technology by June.

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