Icorene 1490 energy data and calculations
How much cycle time is being saved?

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Subjects to present today

- *Introduction to Icorene 1490*
- *Customer Video & Review*
- *Energy calculations, assessing carbon footprint*
- *Lab study energy LYB*
- *Conclusion*

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Icorene 1490 – Introduction

Quick review

Technical Data Sheet

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Icorene 1490 BLK 9001

Linear Medium Density Polyethylene
LyondellBasell Industries
Rotomolding

Product Description

ICORENE® 1490 BLK 9001 is a black UV stabilised hexene linear medium density polyethylene powder. It has been developed for use as a powder in rotational moulding.
This grade is a very fast processing material but also has extremely high levels of ESCR and a very wide processing window for -40C ARM impact strength.
Recommended PIAT can be as low as 130C to 150C depending on the position of the thermocouple.
It is suitable for use in many different applications due to its high ESCR. But it is especially good for reducing oven cycle time by up to 30%. This is done using low PIATs and can result in significantly lower energy usage heating the oven. This effect is multiplied in thicker wall section.
It is easy to process with a low shrinkage tendency. Faster melting can help to distribute the material more evenly across the mould.
ICORENE® 1490 BLK 9001 is not intended for use in medical and pharmaceutical applications.

General			
Material Status	• Commercial: Active		
Availability	• Europe		
Additive	• Antioxidant	• UV Stabilizer	
Features	• General Purpose • Good Flow • Good Moldability	• Good Processability • Good Stiffness • Good Toughness	• UV Resistant
Uses	• Agricultural Applications	• General Purpose	• Tanks
Appearance	• Black		
Forms	• Powder		
Processing Method	• Rotational Molding		

Physical	Nominal Value (English)	Nominal Value (SI)	Test Method
Density (73°F (23°C))	0.938 g/cm³	0.938 g/cm³	ISO 1183
Melt Mass-Flow Rate (MFR) (190°C/2.16 kg)	12 g/10 min	12 g/10 min	ISO 1133
Environmental Stress-Cracking Resistance (ESCR)			ASTM D1693
Condition B, 122°F (50°C), 10% Igepal, Rotational Molded, F50	> 500 hr	> 500 hr	
Condition B, 122°F (50°C), 100% Igepal, Rotational Molded, F50	> 1000 hr	> 1000 hr	
Mechanical	**Nominal Value (English)**	**Nominal Value (SI)**	**Test Method**
Tensile Modulus [1] (73°F (23°C))	109000 psi	750 MPa	ISO 527-2/1B
Tensile Strength (Yield)	2610 psi	18.0 MPa	ISO 527-2/1B
Tensile Strain (Break, 73°F (23°C))	> 650 %	> 650 %	ISO 527-2/1B
Flexural Modulus [2] (73°F (23°C))	116000 psi	800 MPa	ISO 178
Impact	**Nominal Value (English)**	**Nominal Value (SI)**	**Test Method**
Charpy Notched Impact Strength [3] (73°F (23°C))	6.7 ft·lb/in²	14 kJ/m²	ISO 179/1eA
Tensile Impact Strength [4] (-22°F (-30°C))	34.7 ft·lb/in²	73.0 kJ/m²	ISO 8256
Impact Strength [5]			ARM
-40°F (-40°C), 0.126 in (3.20 mm), Rotational Molded	> 63 ft·lb	> 85 J	
Thermal	**Nominal Value (English)**	**Nominal Value (SI)**	**Test Method**
Deflection Temperature Under Load [6]			ISO 75-2/B
66 psi (0.45 MPa), Unannealed	144 °F	62.0 °C	
Vicat Softening Temperature	232 °F	111 °C	ISO 306/A
Melting Temperature (DSC)	261 °F	127 °C	ISO 3146

Icorene 1490 features:

- *Super fast processing saves processing energy*
- *Super high impact*
- *Excellent ESCR*
- *Great moulding & release performance*
- *Excellent final part properties & aesthetics*
- *Process window “widest possible”*
- *Powder “just melted” for excellent properties*

Icorene 1490 – why we want moulders to use it?

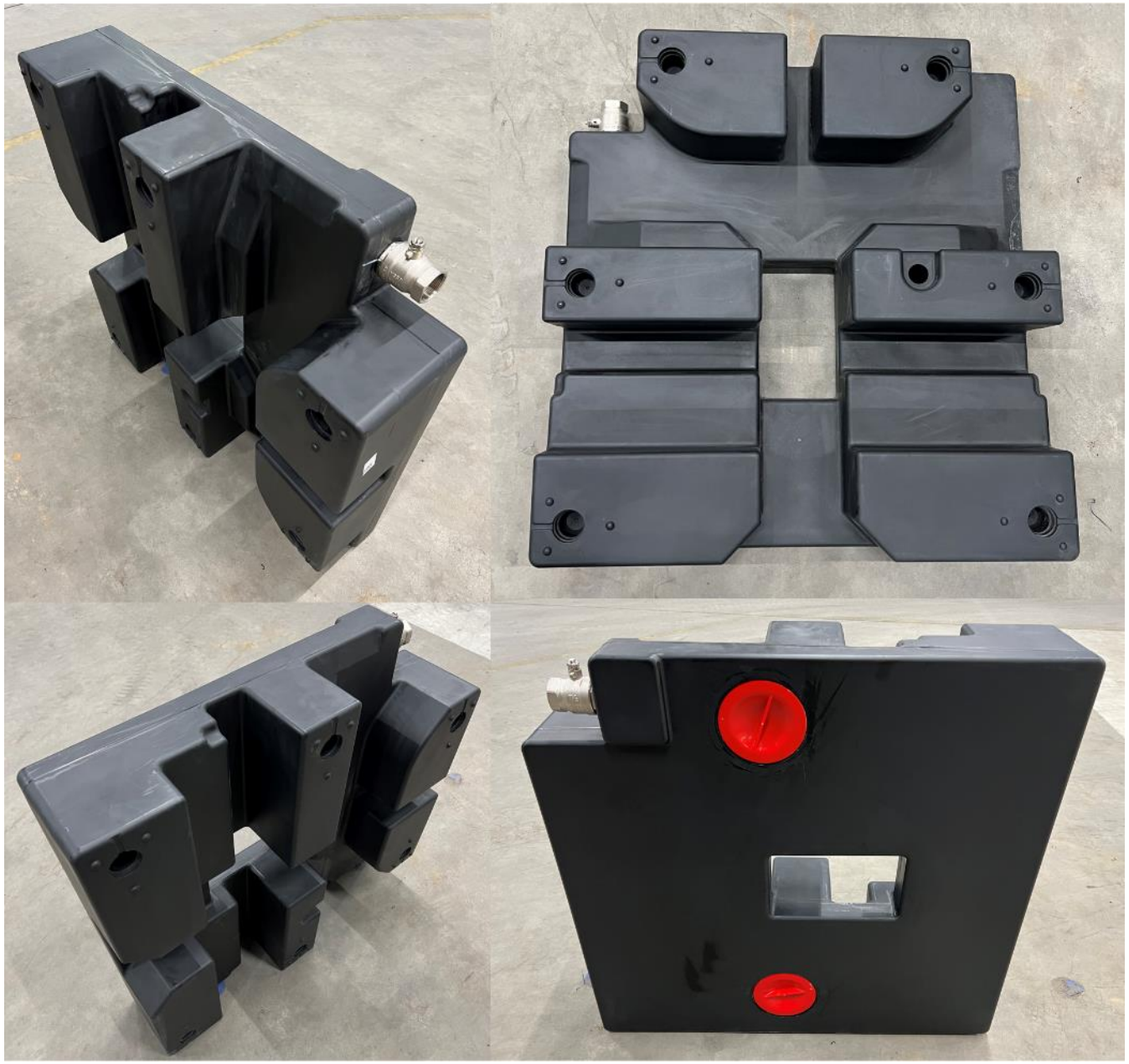
LYB is seeking ways to help rotomoulders to reduce their carbon footprint

Pentas Moulding B.V.
Test-case using *Icorene 1490* powder for a 110L grey water tank

Making rotomoulded tanks with a lower carbon footprint using Icorene 1490

The 11kg tank

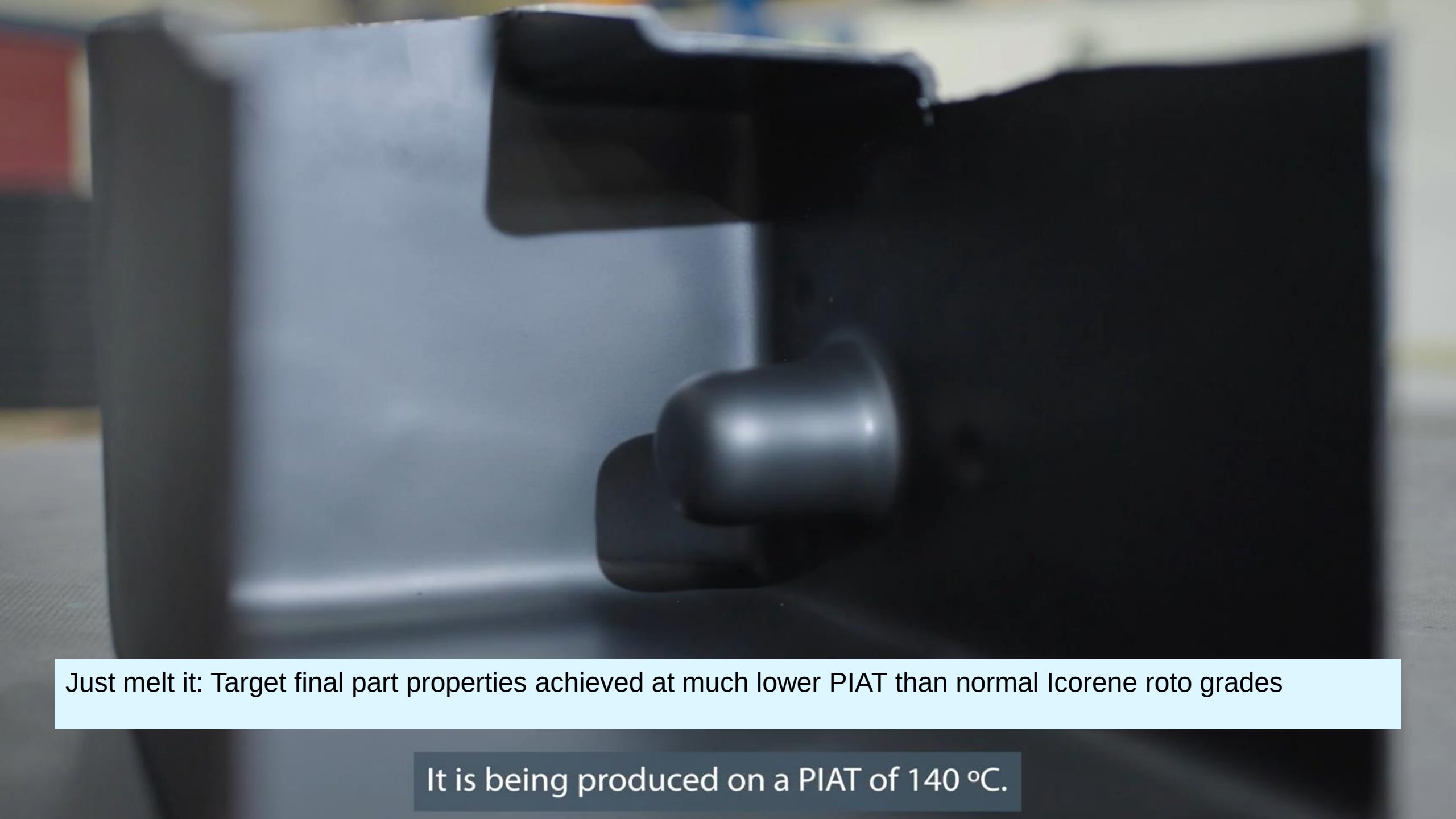
Now made in *Icorene 1490* black powder



38%

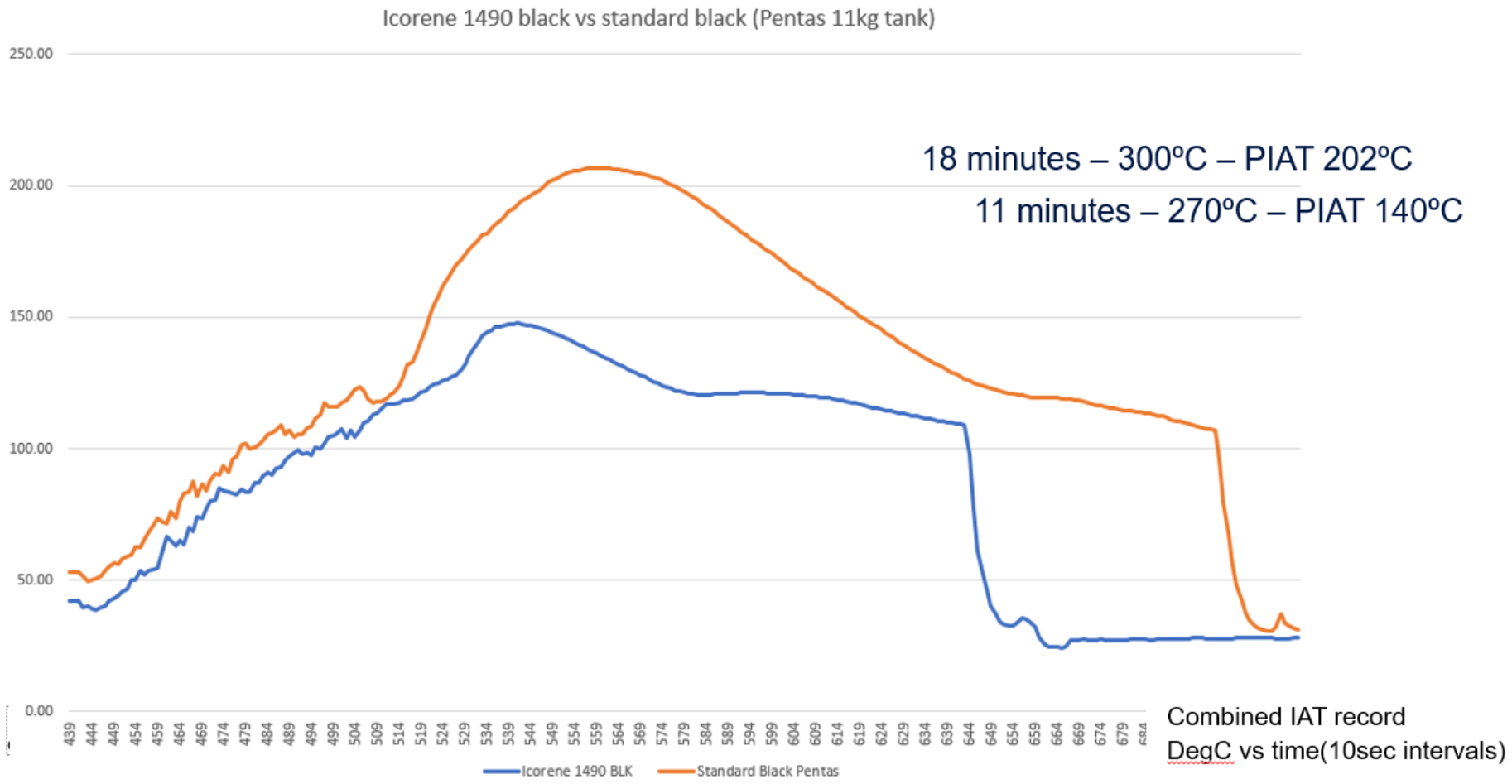
Saving in process time vs their standard powder

Success Story with Pentas *Icorene* 1490



Just melt it: Target final part properties achieved at much lower PIAT than normal Icorene roto grades

Icorene 1490 Black Vs Standard Black Powder



18 minutes – 300ºC – PIAT 202ºC

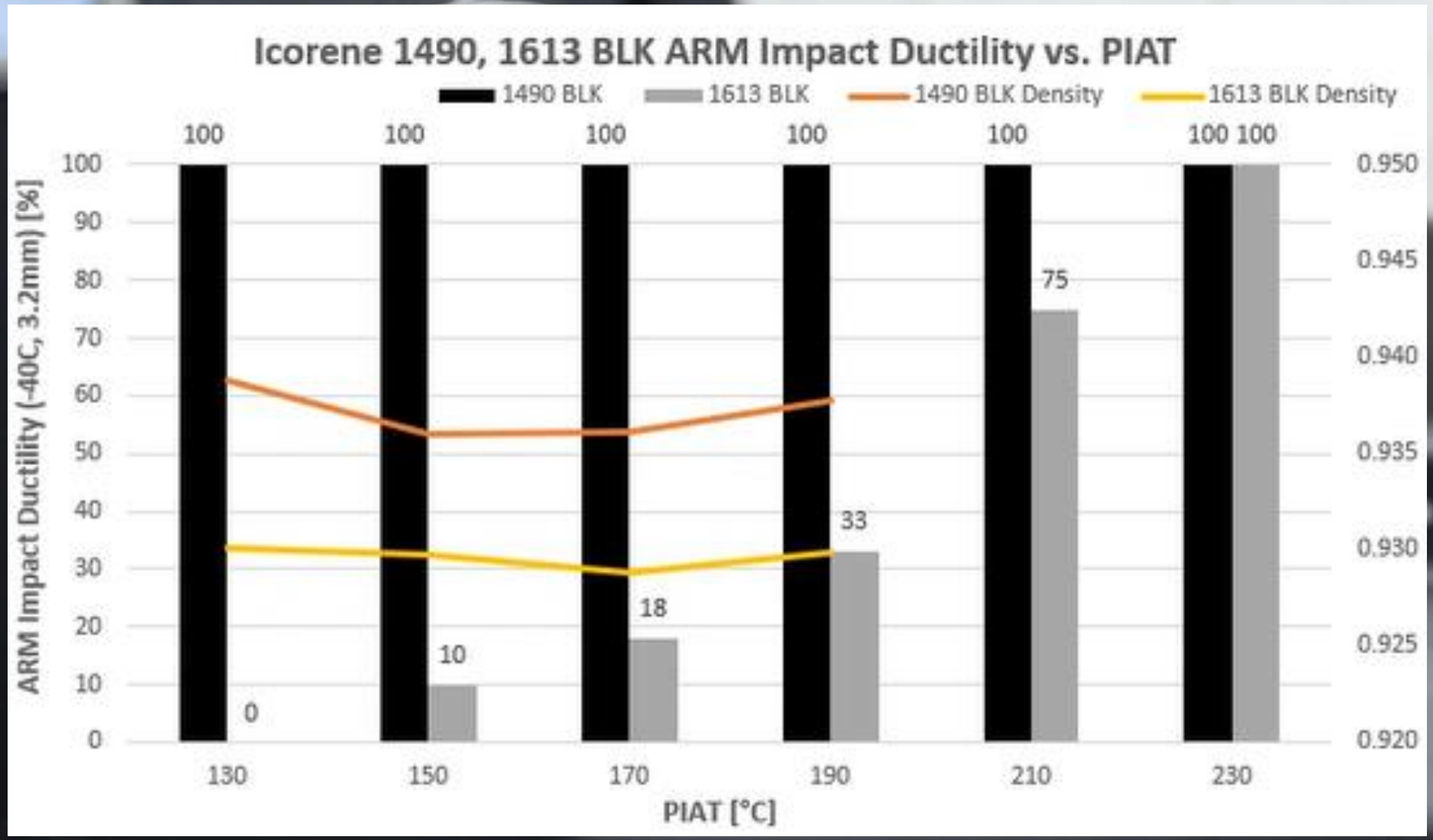
11 minutes – 270ºC – PIAT 140ºC

Combined IAT record
DegC vs time(10sec intervals)

It is being produced on a PIAT of 140 ºC.

Part Strength: Impact toughness and elasticity gains spread across the whole heating process window,

Our first product is a grey water tank for 110 liter for recreation vehicles



Part Strength|@140C: Impact toughness and elasticity gains spread across the whole heating process window,

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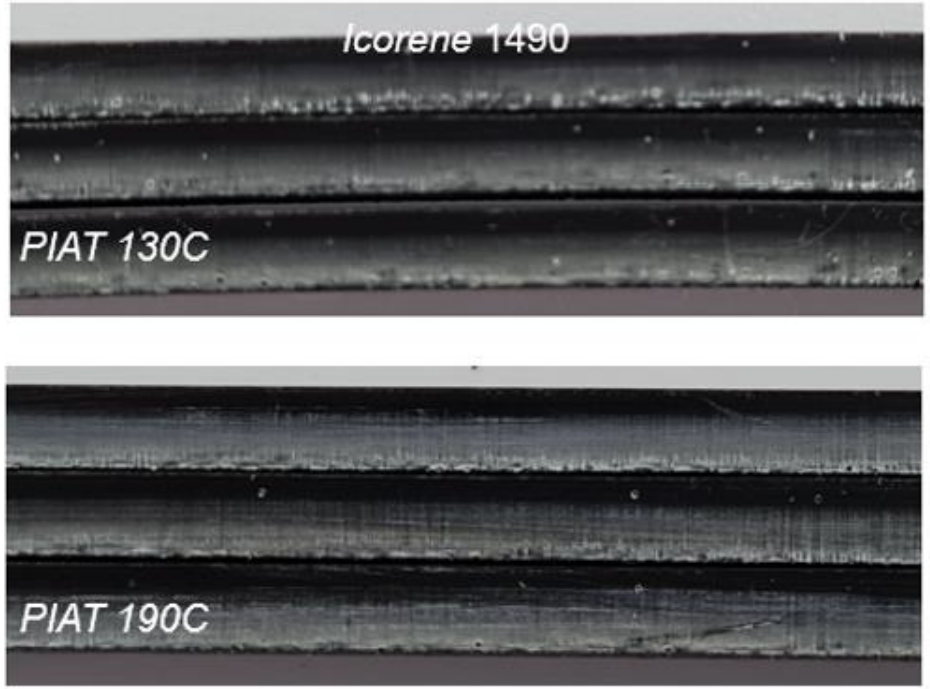
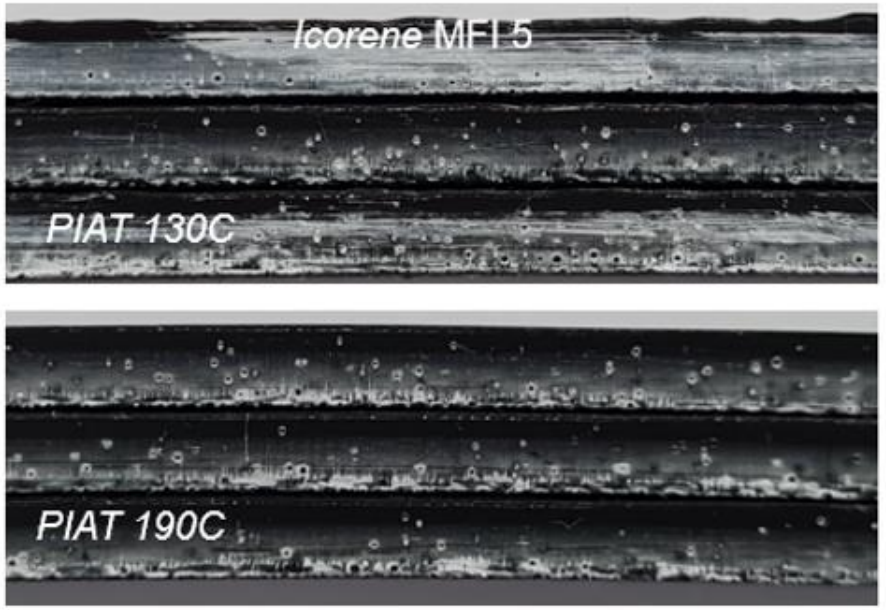
- **Bubble** photo of X section of *three* mouldings of *Icorene* 1490 BLK & MFI 5 for PIAT 130C & 190C
- For black the bubbles are removed faster than the natural

Icorene 1490



STD MFI 5



Our first product is a grey water tank for 110 liter for recreation vehicles

Productivity gain: Same machine can produce **94000** per year on 24/5 vs **54000** per year before.

but also that we now have one part every 4 minutes instead of 7 minutes.

Energy use: **Oven 300C>270C**, gas heat time **18mins>11mins**, cooling fans (elec) **20mins >11mins**

which result in use of less energy.

Pentas Video – Review what they achieved?

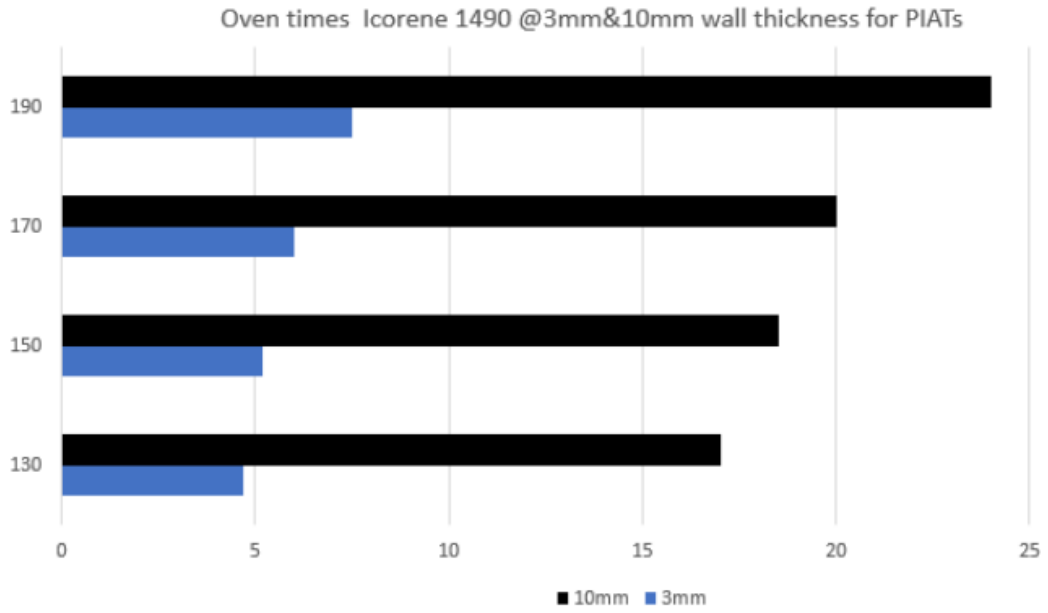
Product:	110L 11kg 4mm “grey water” tank
Brief:	Tough top-quality vehicle tank
Material #1:	934/5 Black powder
Material #2:	*Icorene 1490* black
Cycle time oven #1	18 minutes – 300ºC – PIAT 202ºC
Cycle time oven #2	11 minutes – 270ºC – PIAT 140ºC
Cooling:	Reduction from 20 mins to 11 mins
Volume target:	Large job to occupy full machine
Machine:	2/3 station rotomoulder– 100% of time
Development:	Commercial production
Cycle time saving:	**Reduction of 38% process time**
Goal:	Productivity & CO2 equivalent savings

Energy & Sustainability

Lab Study: Icorene 1490 Black Vs Standard Black Powder

LYB lab test results *Icorene* BLK 1490 vs MFI 5 – heating and cooling time

- We rotomoulded 3mm and 10mm boxes and measured the time to get to PIAT of 130C and 190C where the two materials *Icorene* 1490 and *Icorene* MFI 5 had their respective optimum properties
- For 10mm we used 3.5kgs of powder - saving 7 minutes of heating time by using Icorene 1490 at PIAT 130C.
- For 3mm we used 1.2kgs of powder - saving 3 minutes of heating. For BIGGER tools & thicker walls the savings in time or GAS will be more.



No big difference in processing time to melt or to increase PIAT between the two grades. Smoothness of inside layer is a big difference

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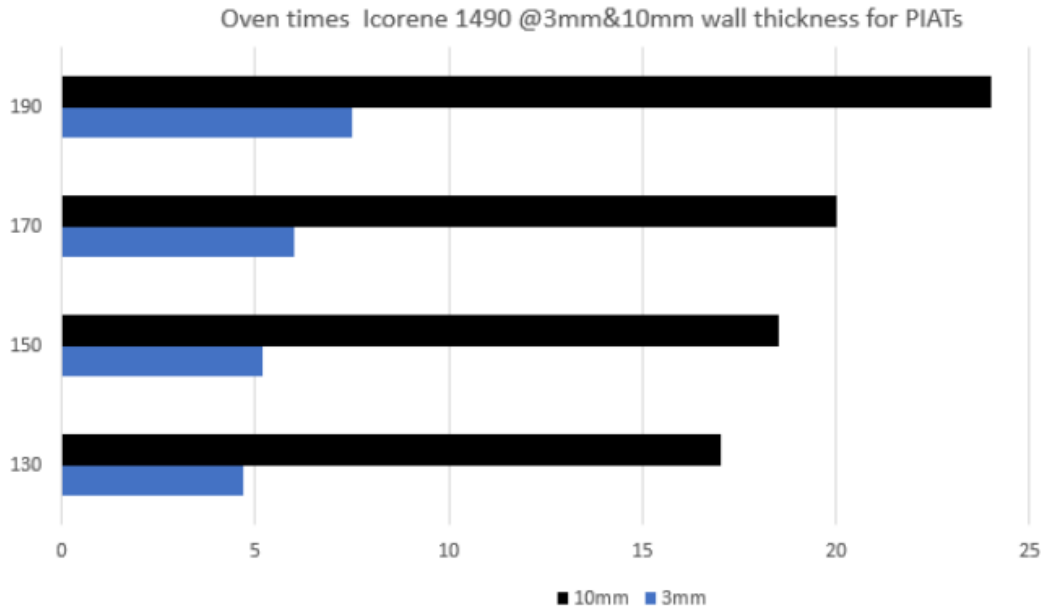

Key Findings:

10mm 1490 = 17 mins oven
10mm MFR 5 = 25 mins oven

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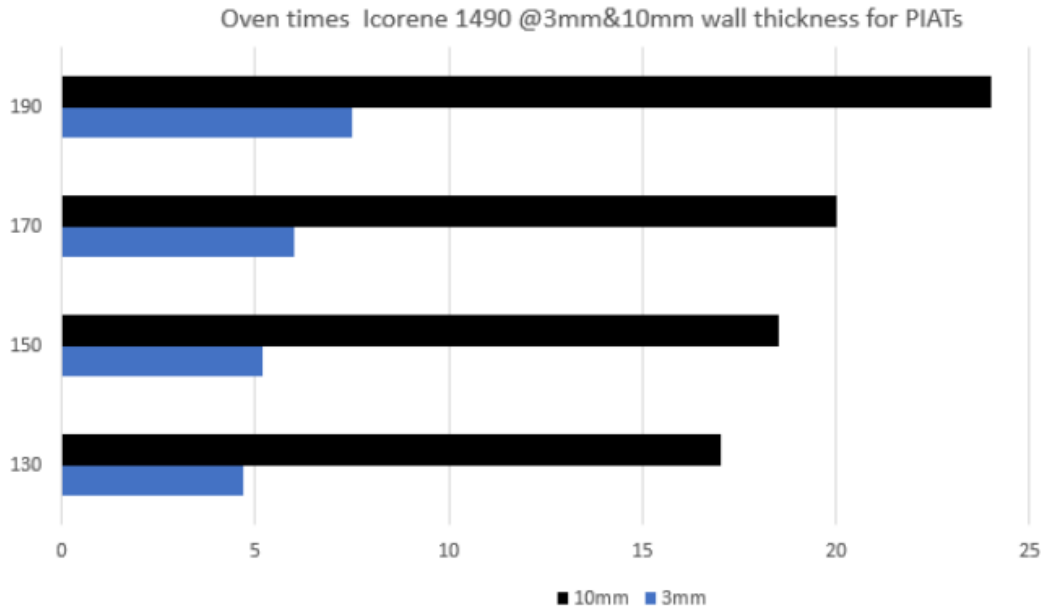

Gas used 1.41m3 vs 1.22m3
Gas saved: 0.19m3
CO2 equivalent: 0.4kg

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Wrap up: *Icorene 1490* processing, energy saving & performance

Getting real energy savings with *Icorene 1490*… It's happening

- **Customers are using lower PIAT or shorter oven times with *Icorene 1490*:**
  - **Saving process energy!**
  - **Superb impact resistance achieved immediately *just melt it!***
  - **Cooling time is reduced due to *less heat input***
  - **Bubbles in wall are unusually low at very short oven time**
  - **Density development & stiffness is instant upon melting**
  - **Properties such as tensile or charpy impact remain consistent even at very low PIAT**

- **Moulders who choose to *cook Icorene* 1490 parts, have fewer concerns on final part performance**

"Just Melt it"

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For more information about *Icorene* 1490

- **John Steele, Technical Service Manager**

John.Steele@lyondellbasell.com

- **For arranging a full technical discussion about how *Icorene* 1490 can benefit your business or if you would like a trial? please make contact with your local LYB sales person.**

- **THANK YOU!**

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