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XALOY®
Solutions through Innovation.™

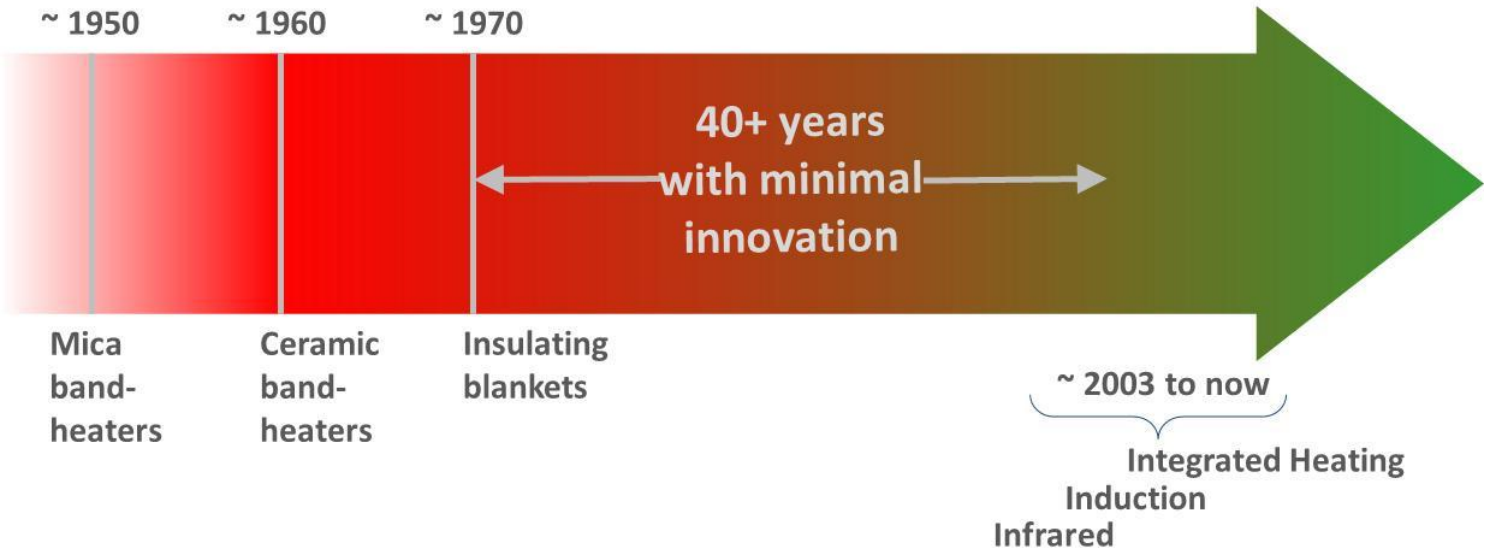
Integrated Melt-Stream Heating

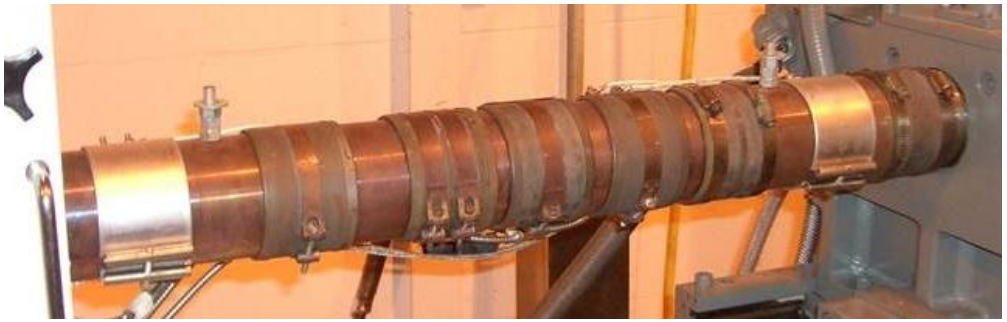
2011 AIMCAL , October 23–26

Bruce Taylor, Xaloy

Integrated Melt-Stream Heating

Melt-stream heating technology evolutionary timeline





Conventional band-heaters

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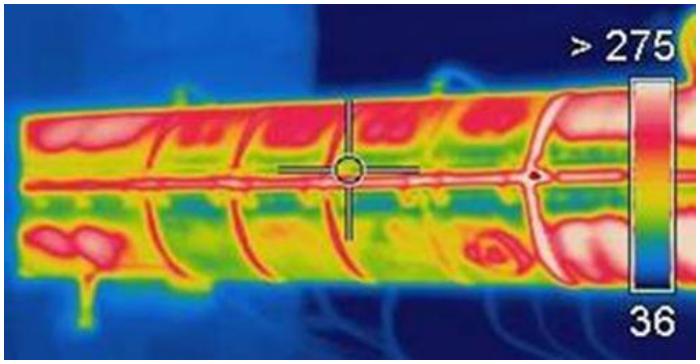
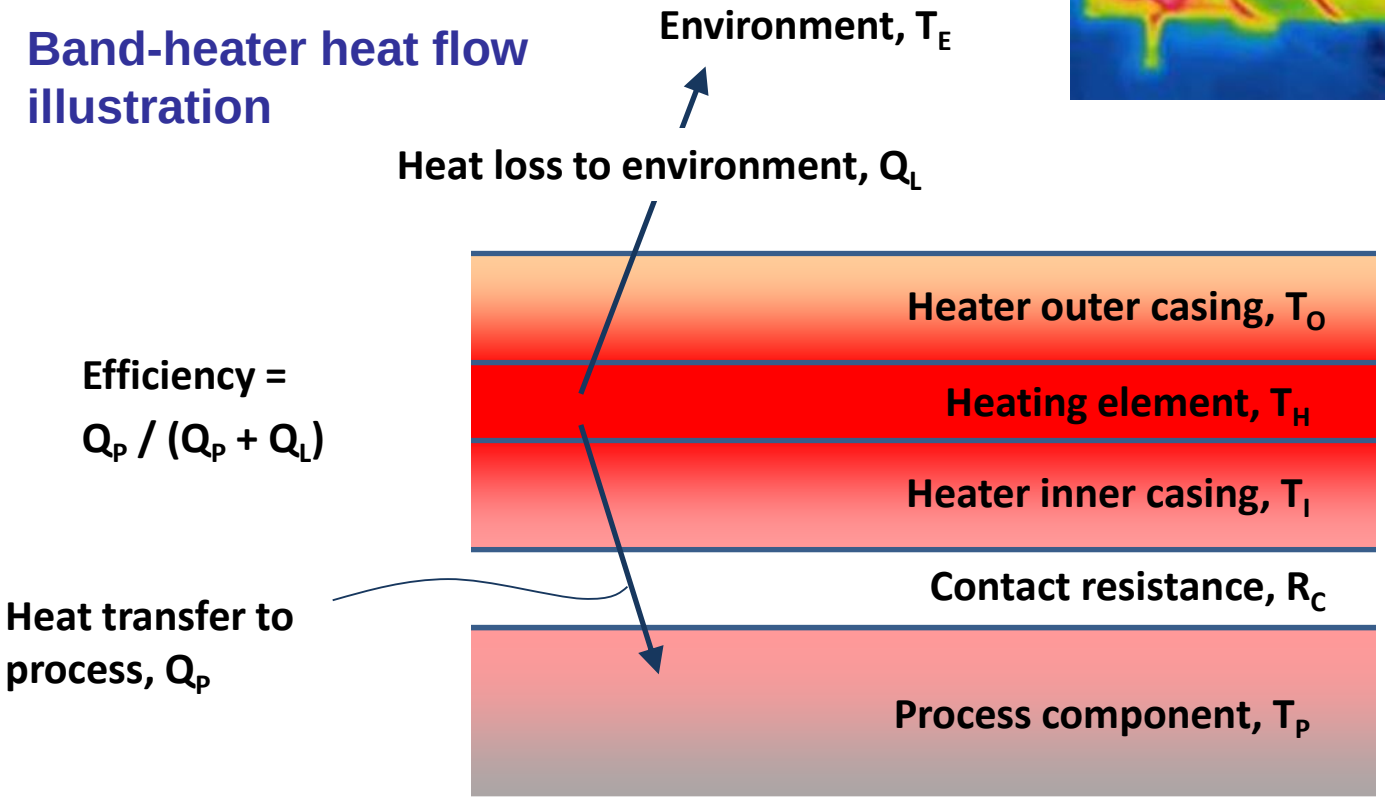
Typical band-heater IR camera temperature profile



Band-heater heat flow illustration



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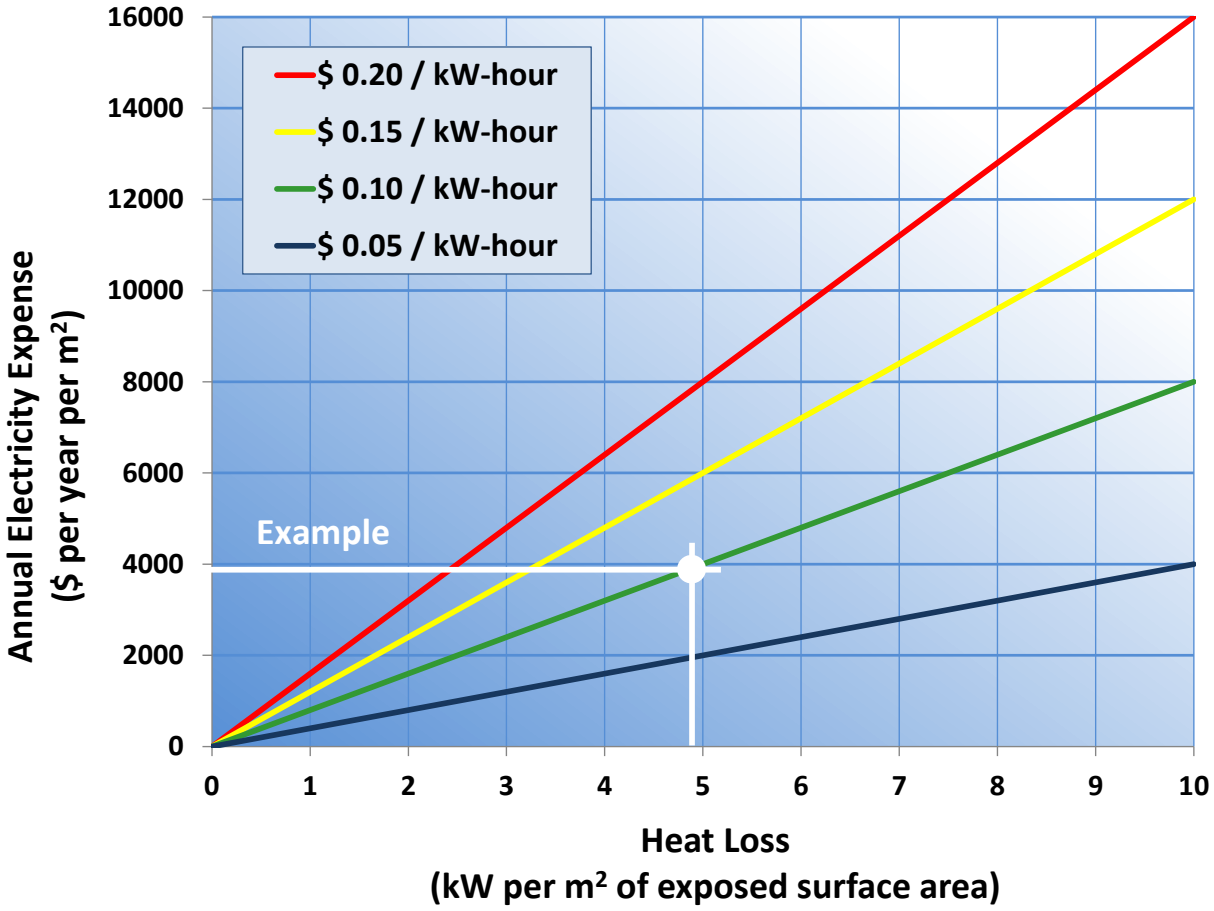
Potential electricity cost savings from thermally insulating hot plasticating machine surfaces



For blended electricity rates from 5 to 20 cents/kW-hour and based on 8000 operating hours/year

Example:

Heat loss of 4.8 kW/m^2 (450 watt/ft^2) of un-insulated surface, combined with an electricity rate of $0.10/kW-hr and 8000 hours of operation, translates to a significant thermal-insulating savings of $3900/m^2/year ($360/ft^2/year).

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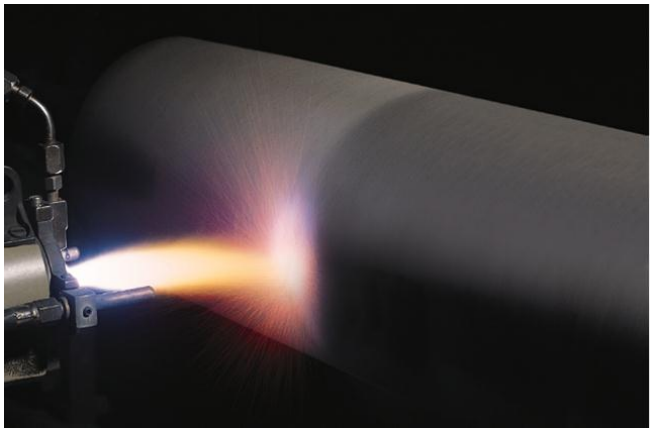
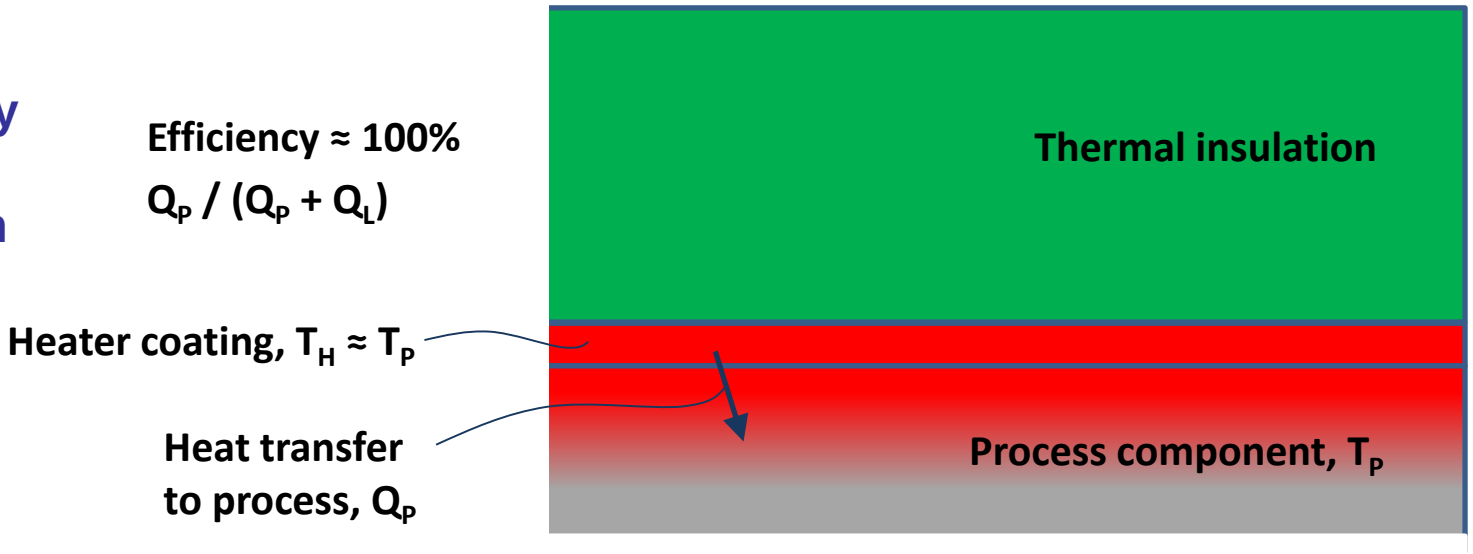


Plasma-spray application of heater coating

Integrated technology heat flow illustration

Efficiency ≈ 100%

$Q_P / (Q_P + Q_L)$



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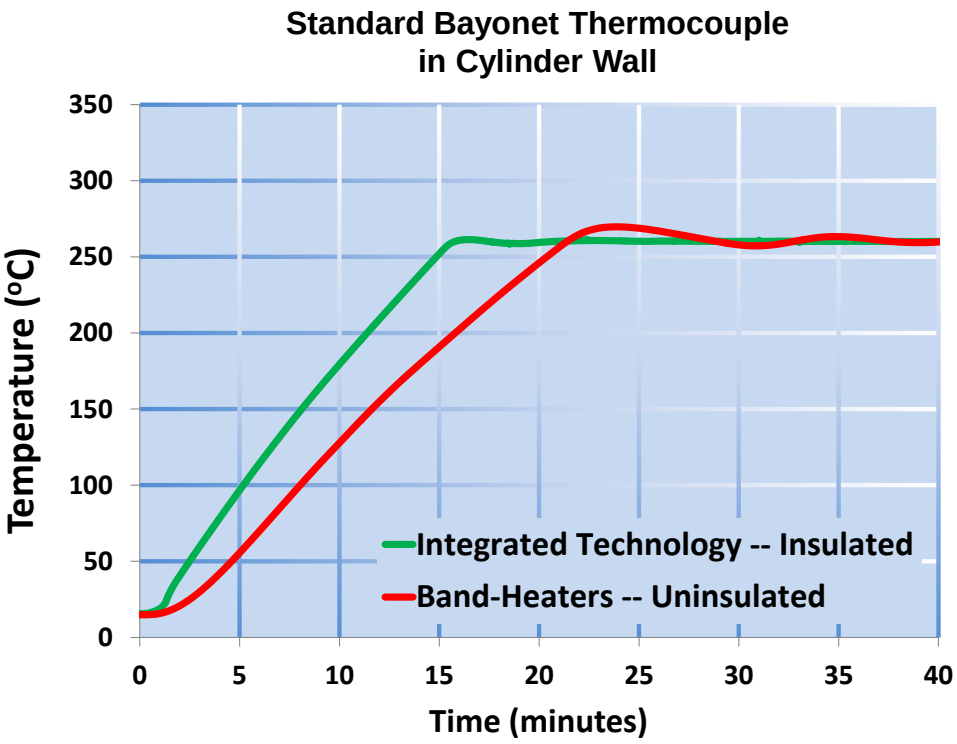
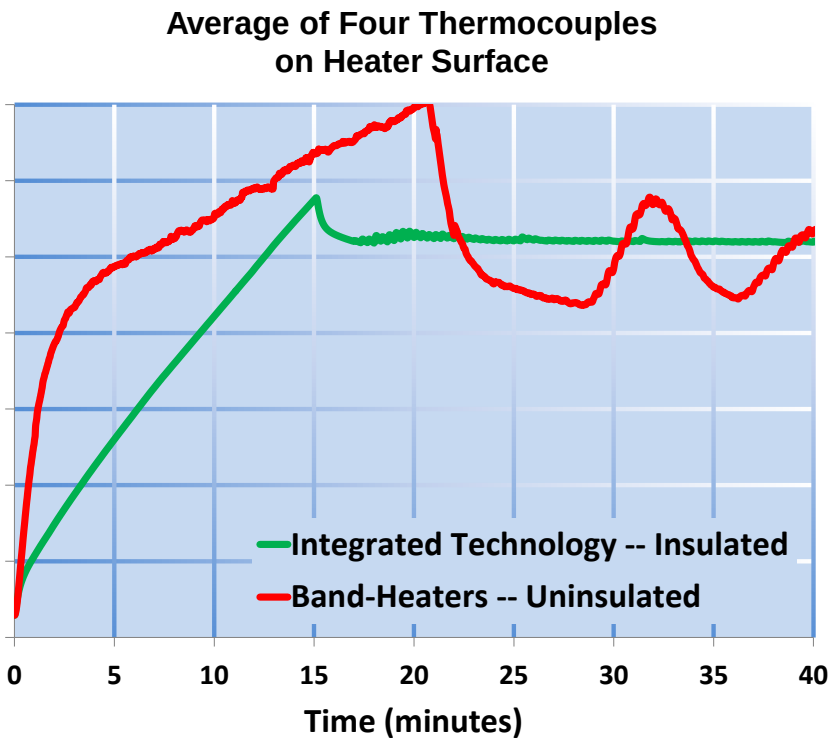
Comparison of process temperature response



Comparison of heater temperature response



- 90mm OD cylinder with 36mm ID (3.54” OD, 1.42” ID) with 38mm thick thermal insulation
- 23% less amperage, 30% faster to target, stabilizes 75% faster

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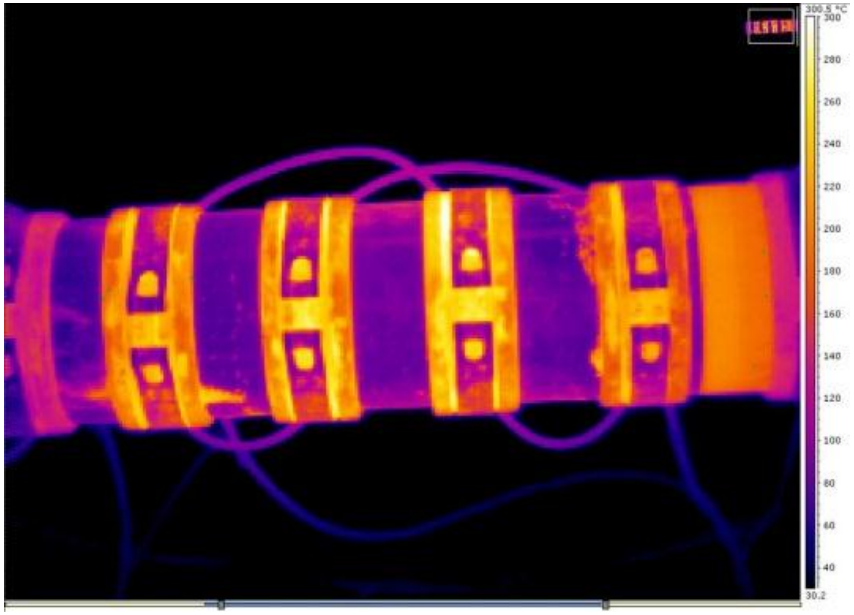
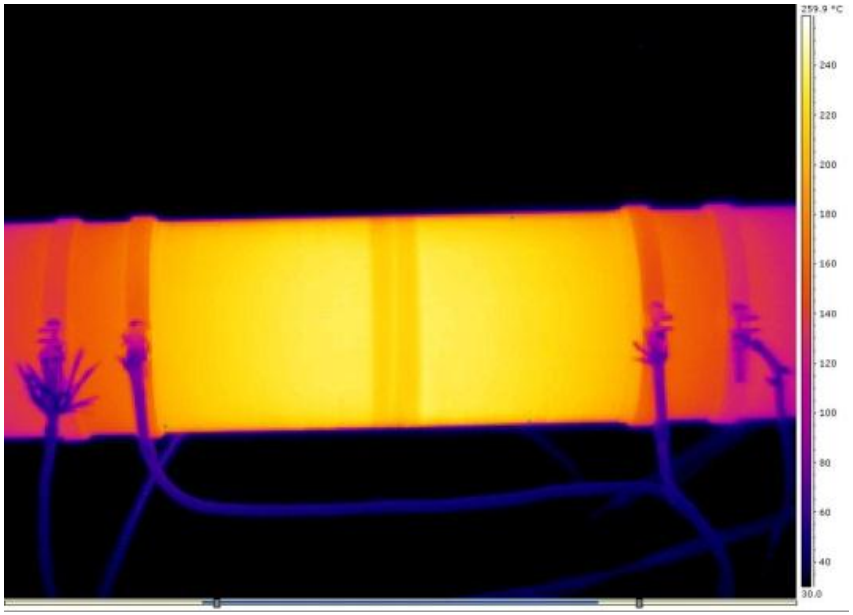
Comparison of heating uniformity

Band-heater IR camera temperature profile



Integrated heating IR camera temperature profile



90mm OD cylinder with 36mm ID (3.54” OD, 1.42” ID)

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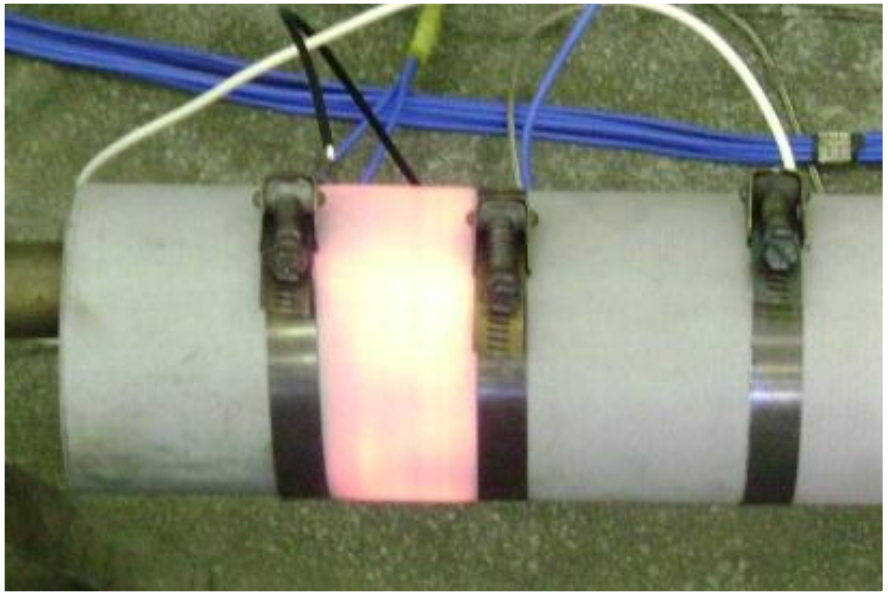
Thermal cycling tests



Extreme testing to 1093°C (2000°F) with 40 watts/cm^2 (260 watts/inch^2)

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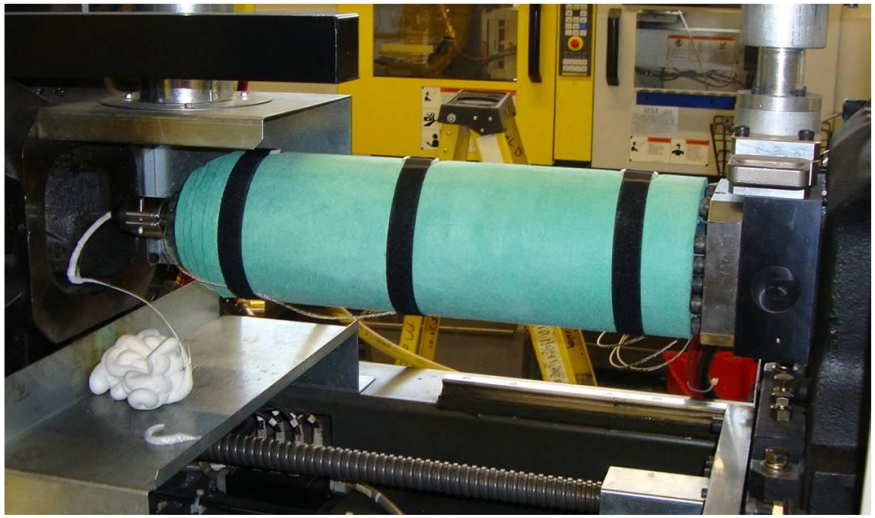
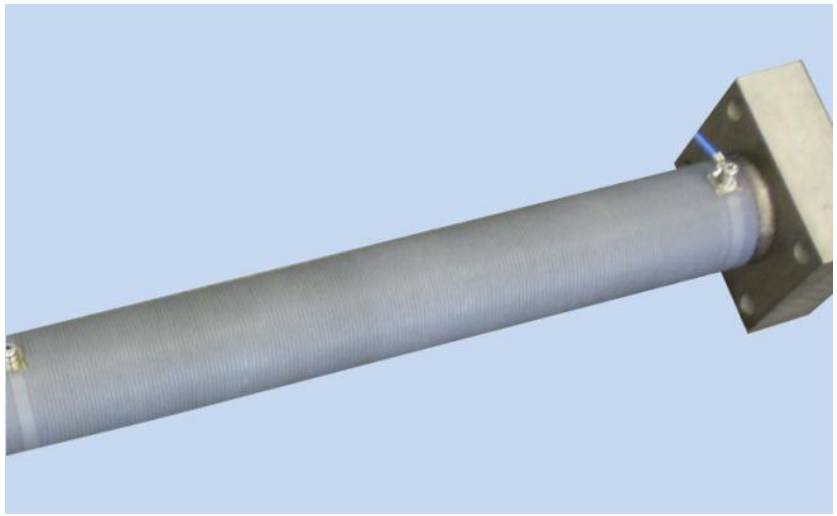


Injection molding barrel with tightly wrapped thermal insulating sheet secured with standard Velcro straps



Transfer pipe with integrated heating technology

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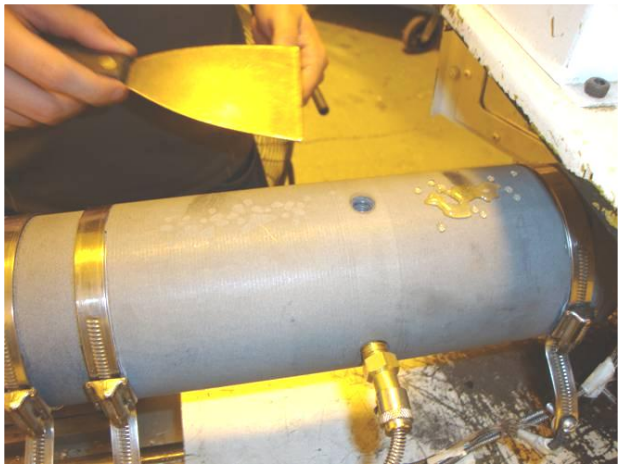
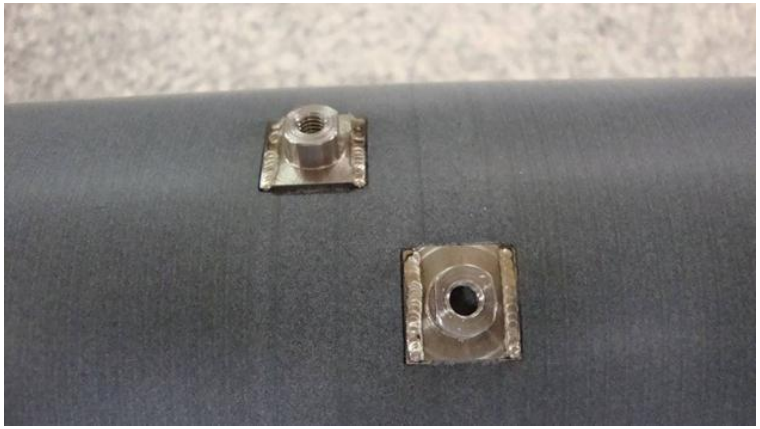
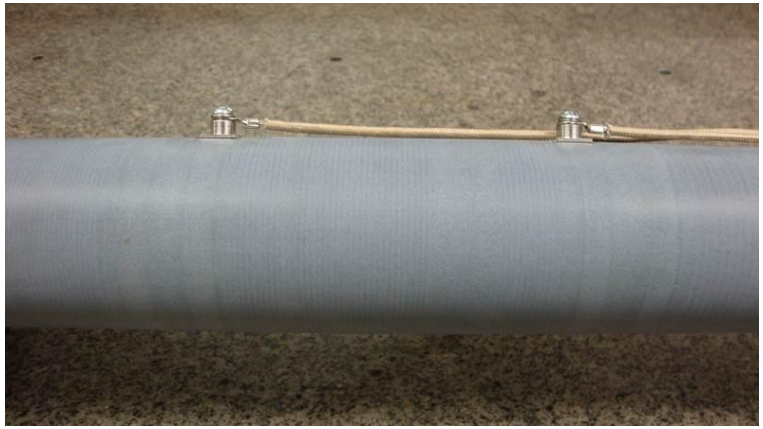


Resin bonding and contamination tests



Stainless steel 15-amp threaded terminations



Low-profile connections with ring terminals and high-temperature (538°C/1000°F) hook-up wire

Integrated Melt-Stream Heating

Technical advantages of Integrated Melt-Stream Heating

- Eliminates heater-to-process contact resistance to minimize heater temperature elevation
- Prevents heater oxidation
- Virtually eliminates heater thermal inertia
- Ensures extremely uniform heating that never degrades or changes
- Provides a smooth contour that is easily wrapped with high-performance inexpensive insulation

Practical benefits of these technical advantages

- Extended heater life (design expectation is infinite life) for reduced downtime and maintenance
- Minimized temperature control response time for better process recovery and stability
- Improved process and product uniformity
- Maximized energy efficiency
- Improved operator safety