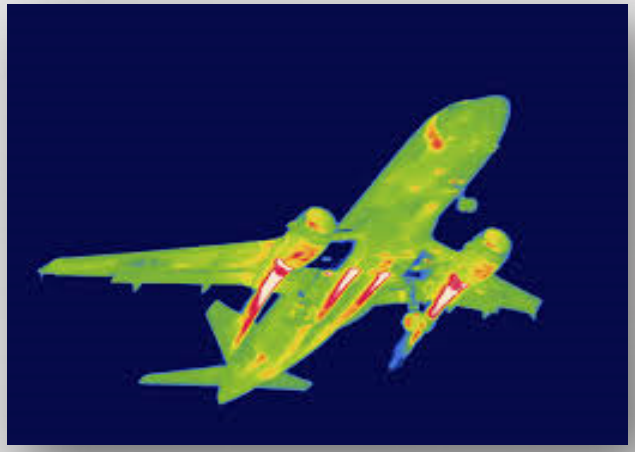
Increasing the HPDC process quality and control with the use of a modern Thermographic System - DTC

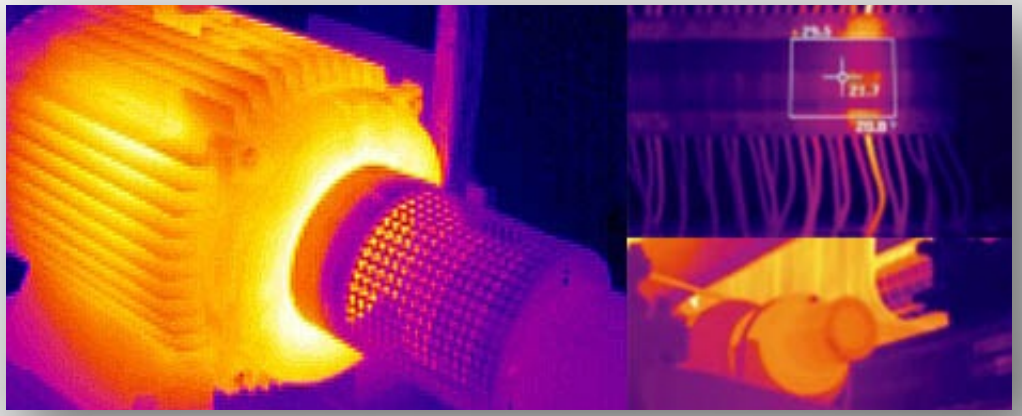
a brand of FREUDENBERG

Chem Trend
Release Innovation™

Thermography

- Infrared thermal image
  - Infrared energy converted in thermografic images

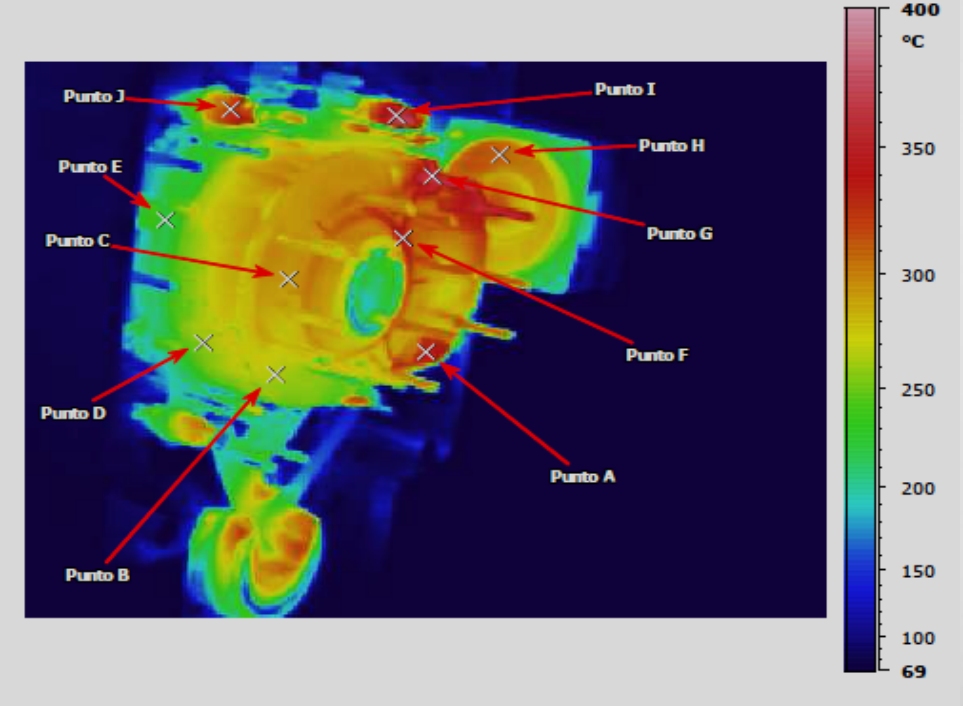




Thermography

- In HPDC, thermography is a useful technology which helps to understand and maintain the thermal balance of a die, acting mainly on thermoregulation and on the correct application of the release agent

- Main advantages:
  - Fast (moving objects)
  - Non-contact (= no hazard)
  - Overview of temperature
  - Digital data
  - In-line analysis
  - Off-line analys

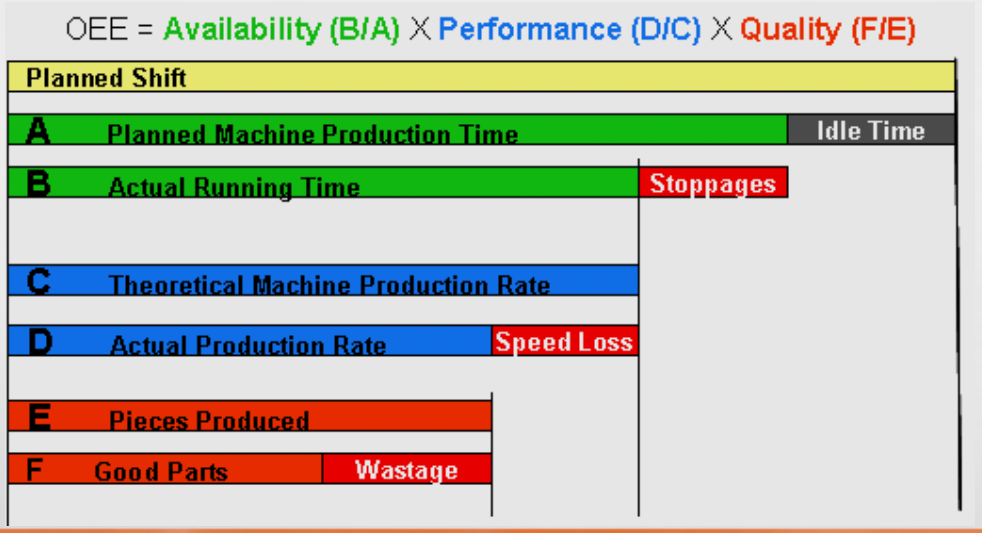


The value-added

- The DTC is a monitoring device for the series production:
  - Start-up > reduction of scrap rate
  - Die Sampling > reduction of sampling times
  - Improved productivity > shorter lubrication times
  - Criticist «finder» > quality check
  - Extended die-life

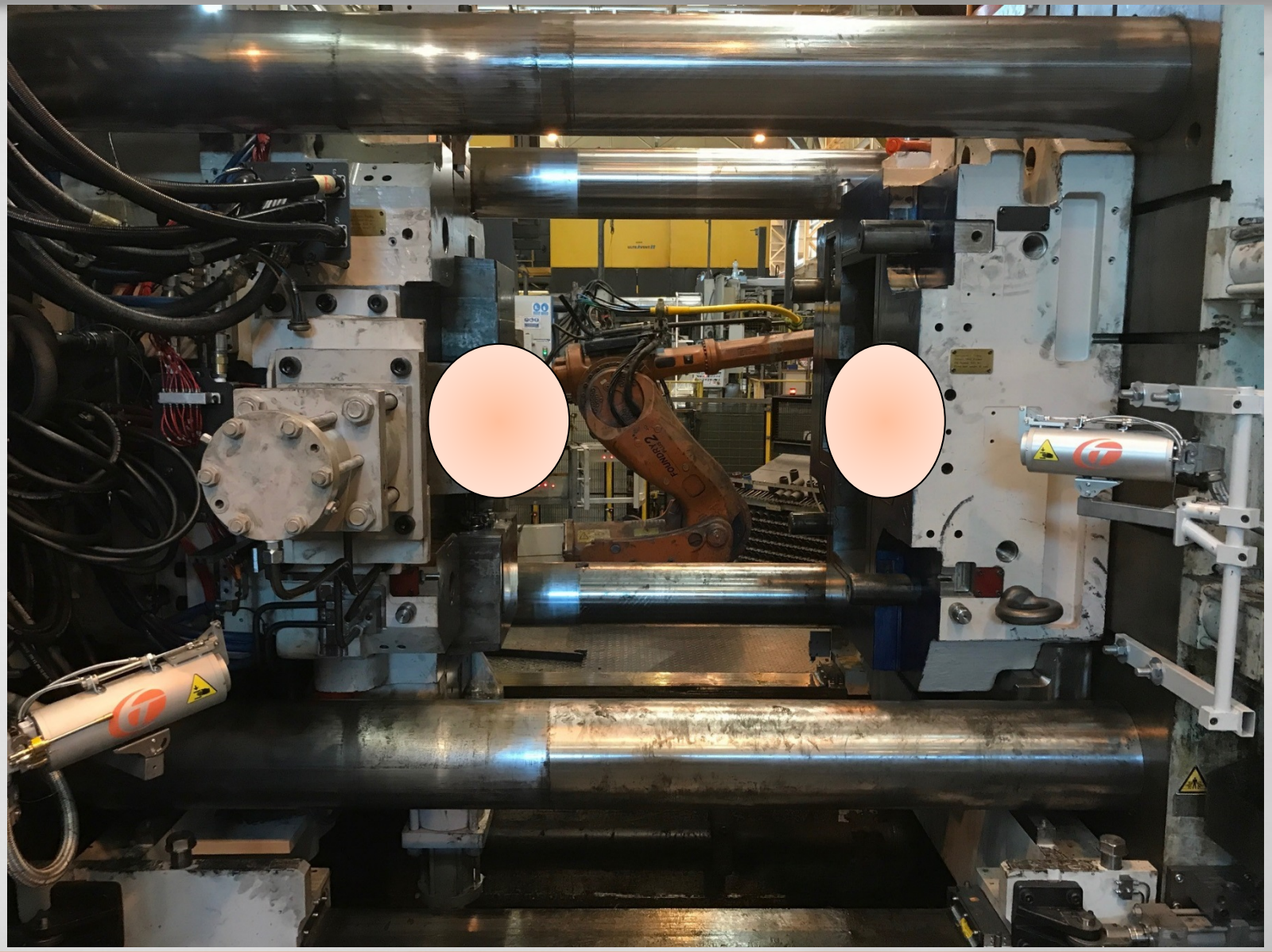
Indirect benefits

- Waste water reduction
- Enhanced casting quality
  - cold flows, shrinkages, porosities, die-solderings, etc.
- Increased productivity
- Improved OEE
  - Overall Equipment Effectiveness of the HPDC cell



DTC – Die Thermal Control

DTC – Installation on DCM



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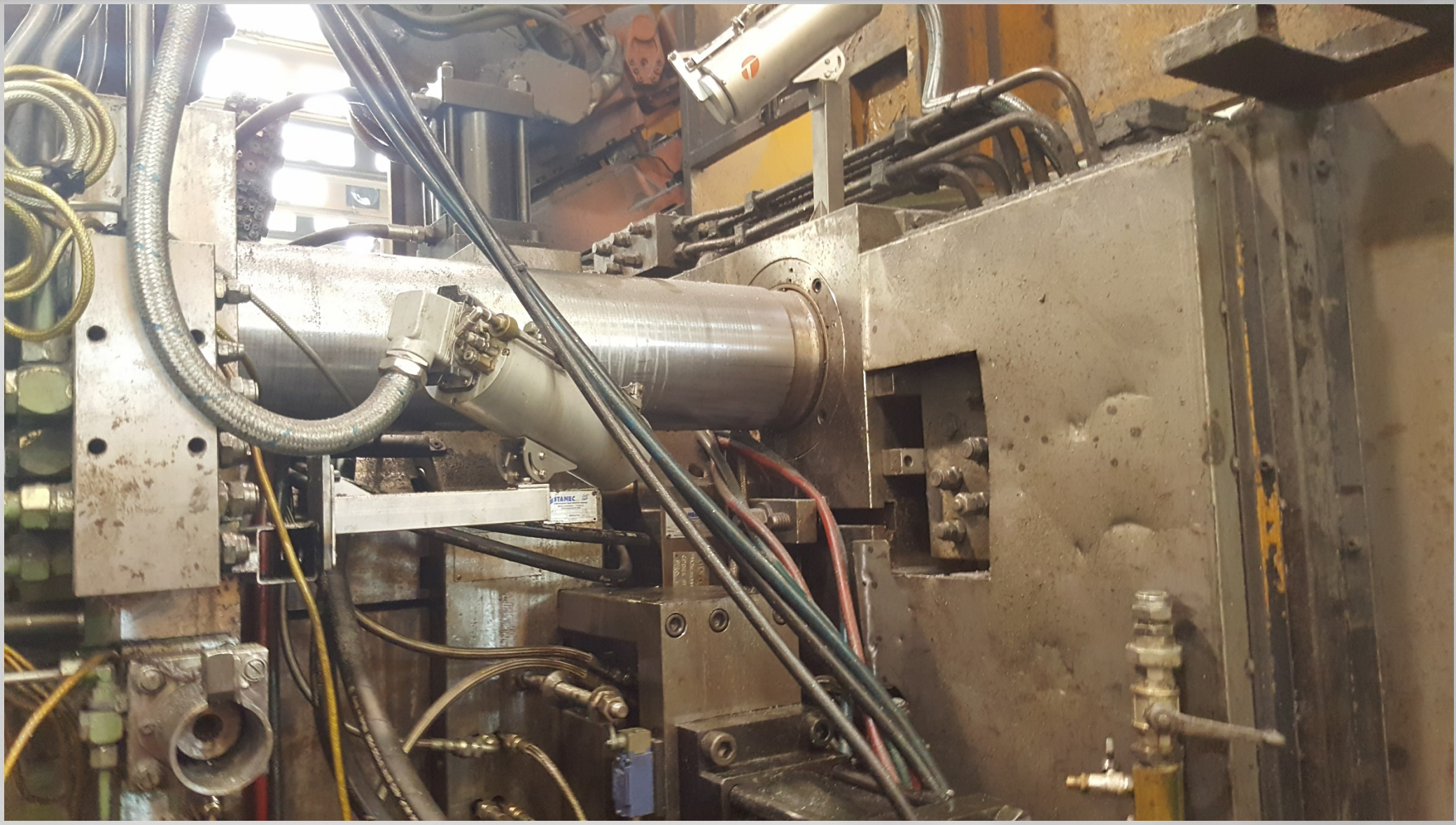

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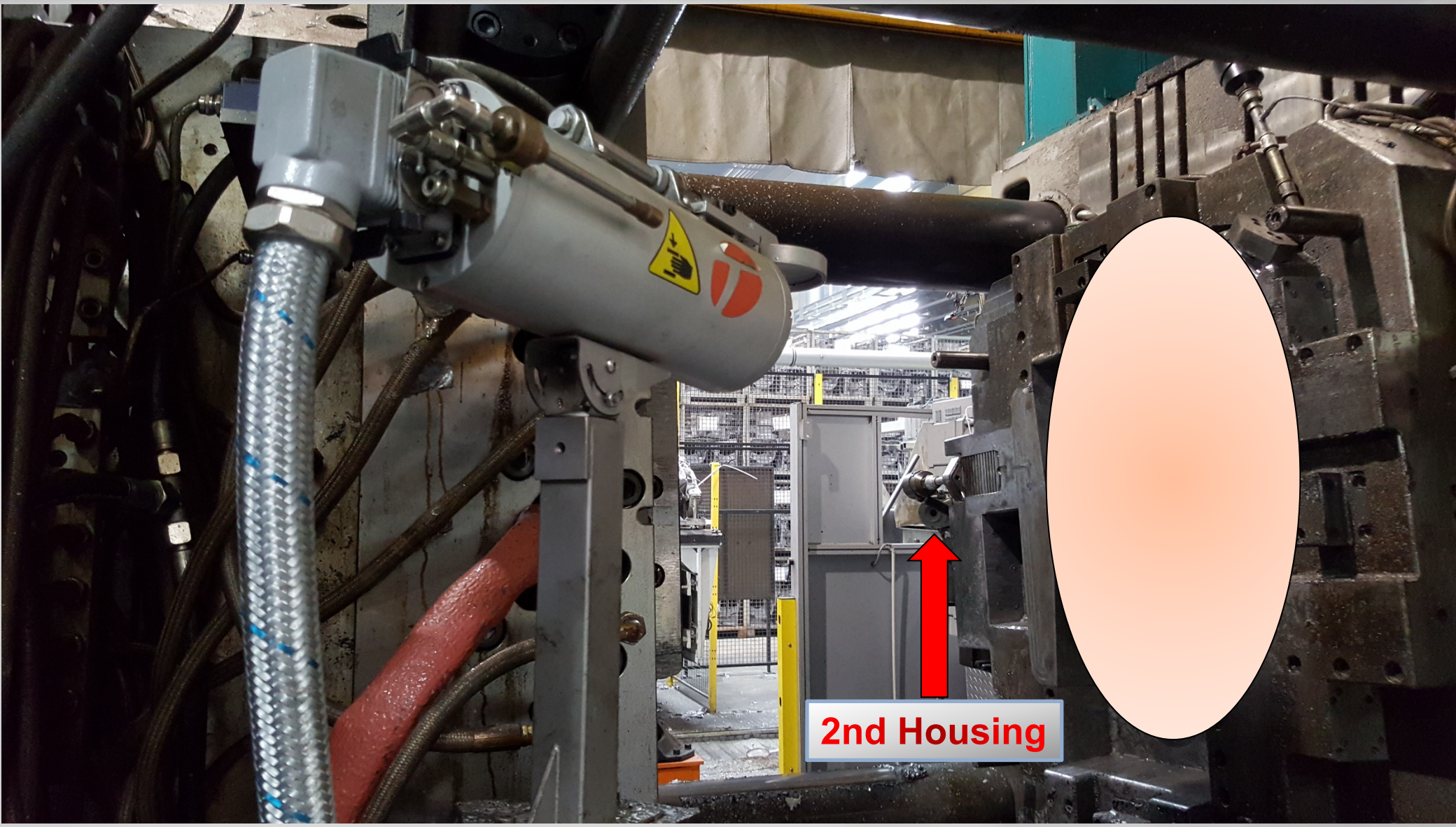


DTC Software – Main page

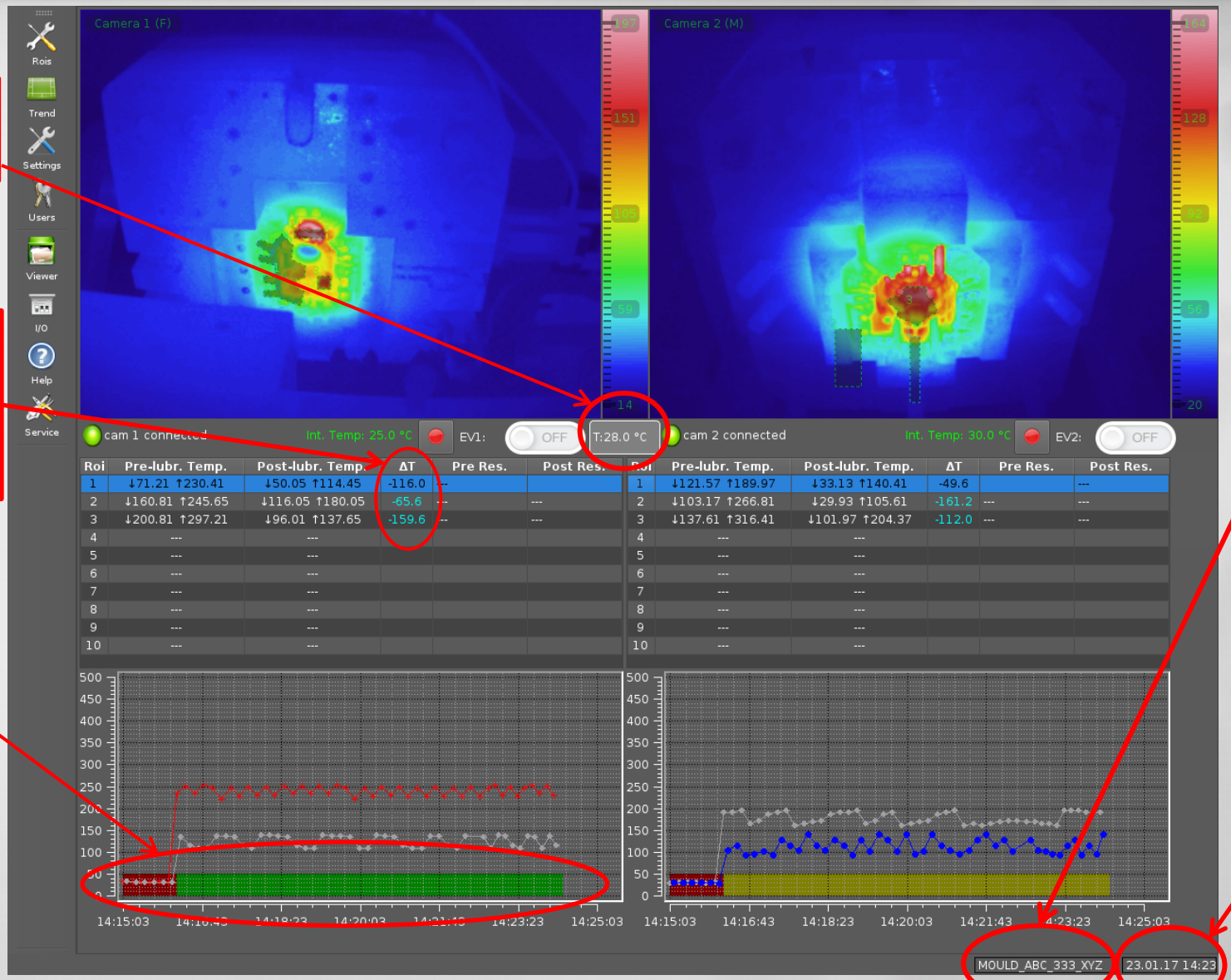
Movable spot on image

Temperature difference of POST vs PRE lubrication

Warm-up bar

Name of Mould

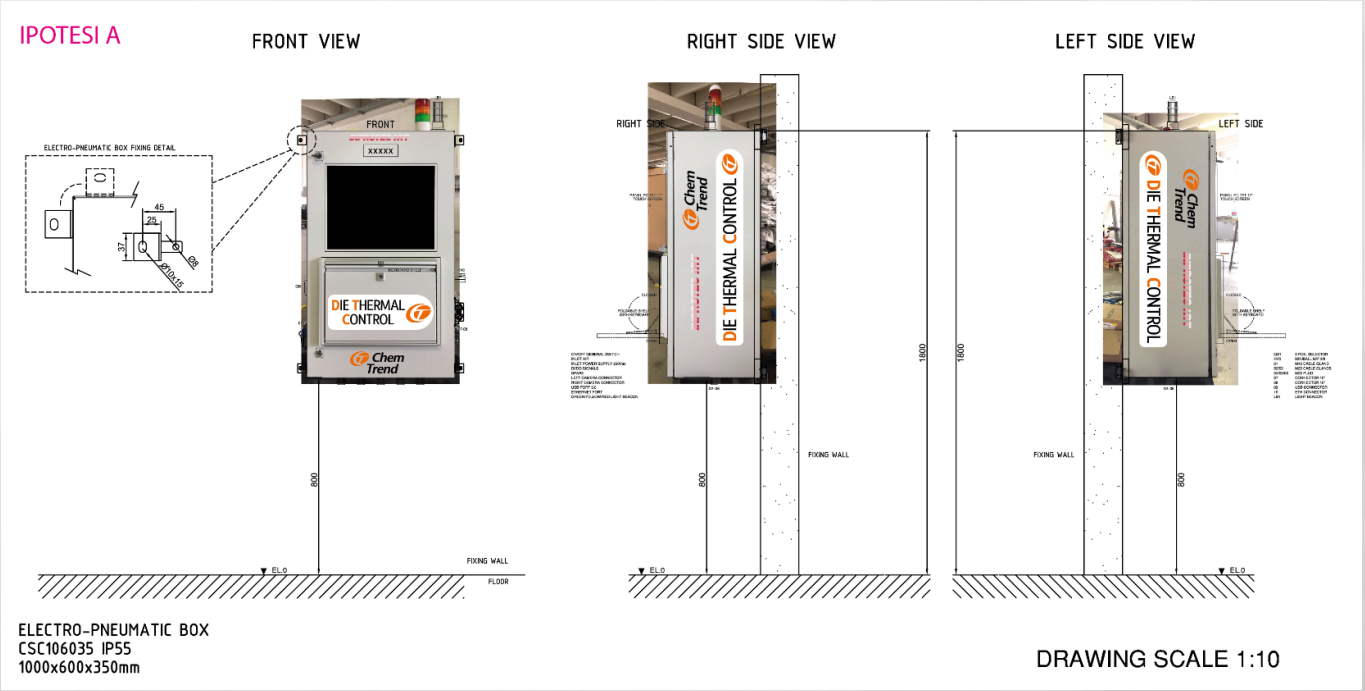
Date & Time



DTC – Trolley version

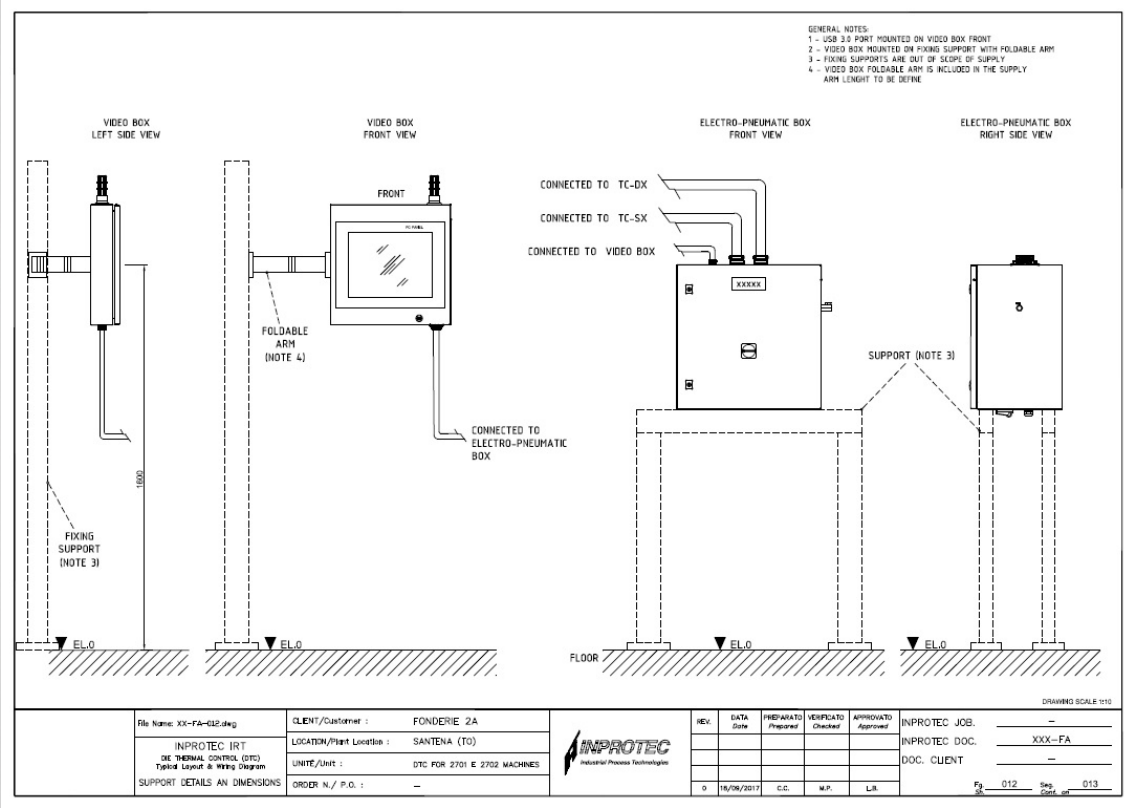
DTC – Fix version

- Developed for OEM to install on HPDC machine
  - All the version of DTC (Trolley, Fix, Remote) have the predisposition for the connection in the Network Ethernet of the customer, and is conforming to the requisite for “Industry 4.0”
  - Each DTC is also however autonomous and accessible in the place where is installed, with access through password.



DTC – Remote version

- Developed for Custom installation on HPDC machine



Panel PC positioned to operator side on mobile arm and electropneumatic cabinet to install on wall or raised support

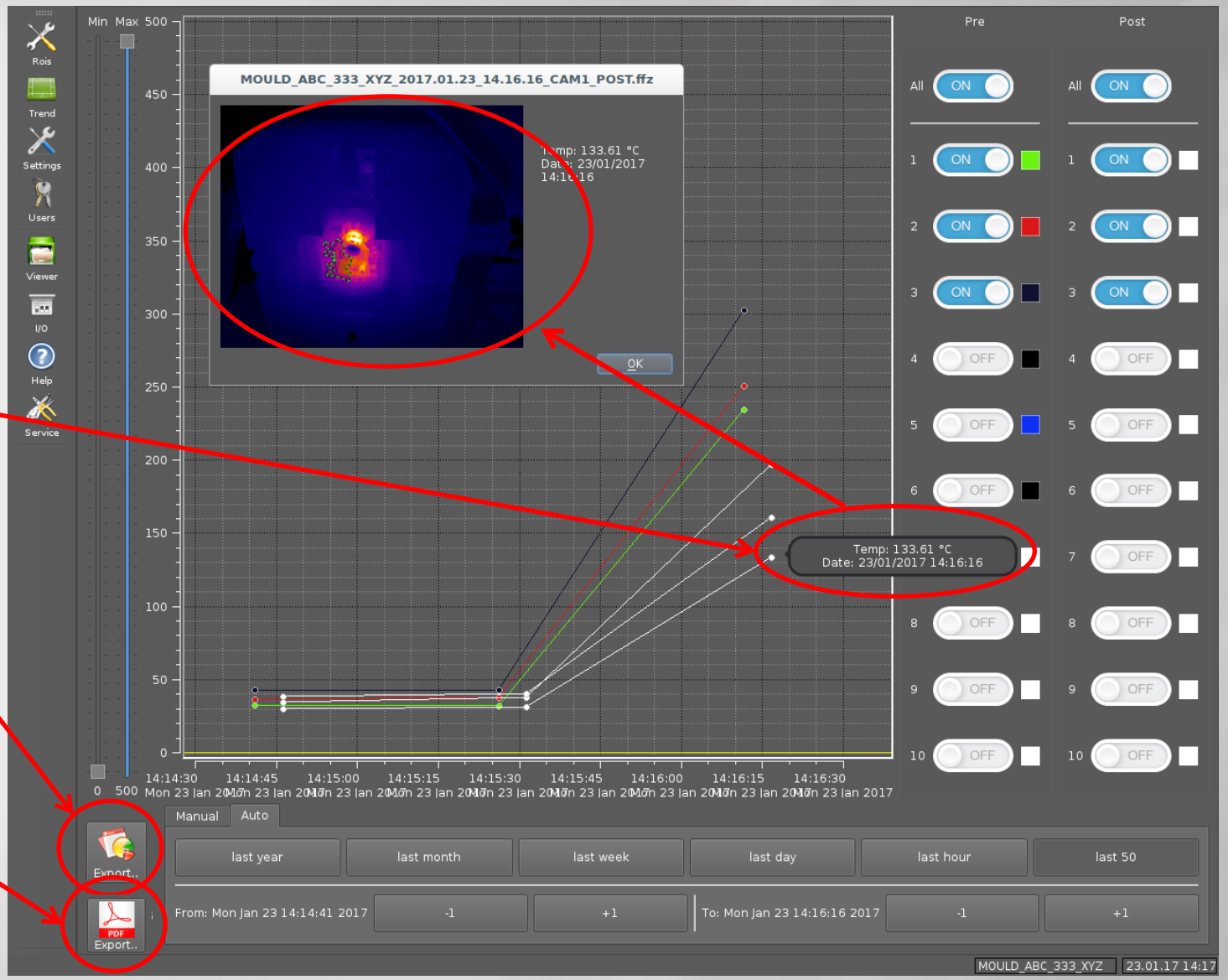
DTC – Remote version

DTC – Data-trend page

A click on shot point: ROI temperature, Date & Time

Export the temperature data directly to Excel file

Fast PDF reports



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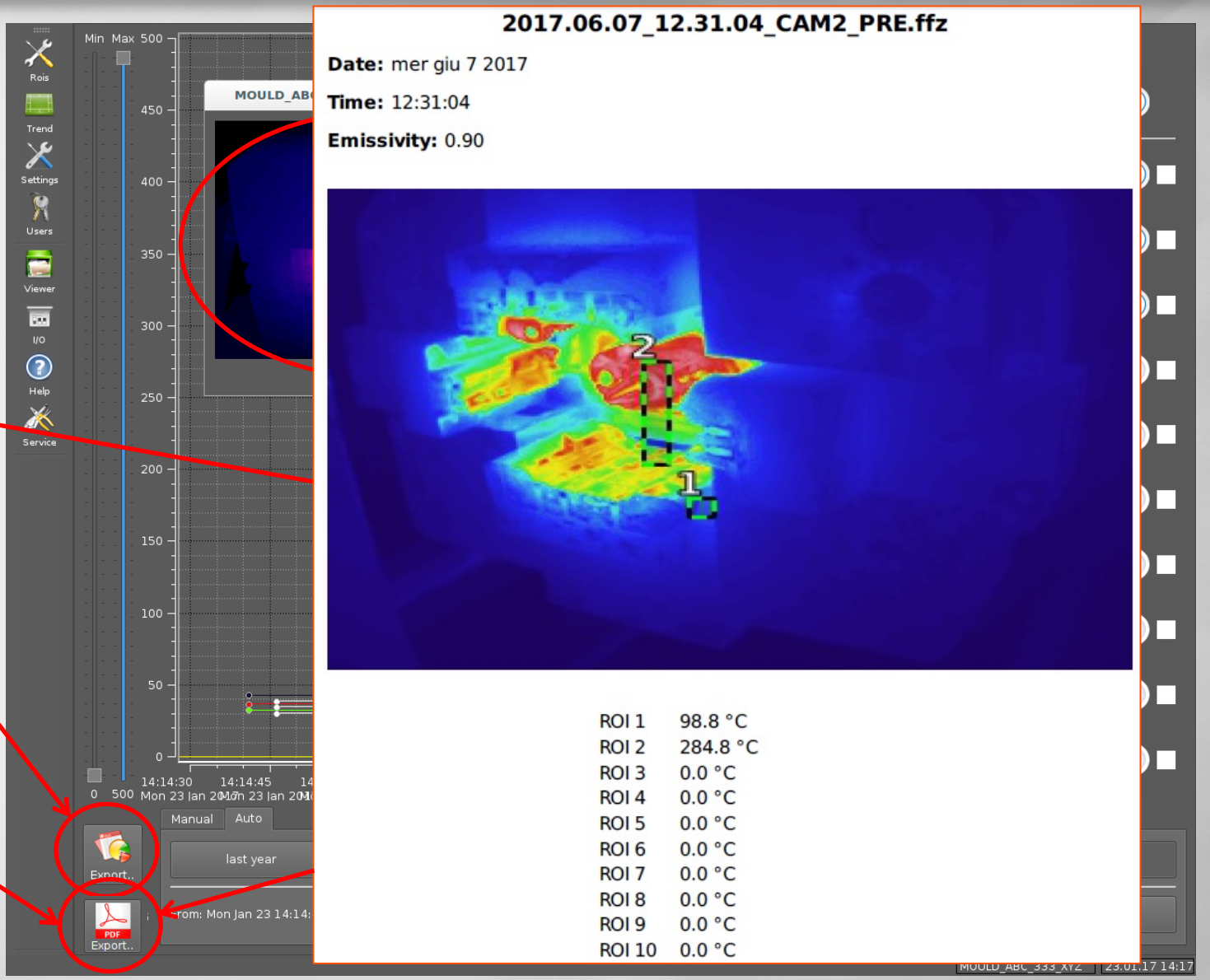
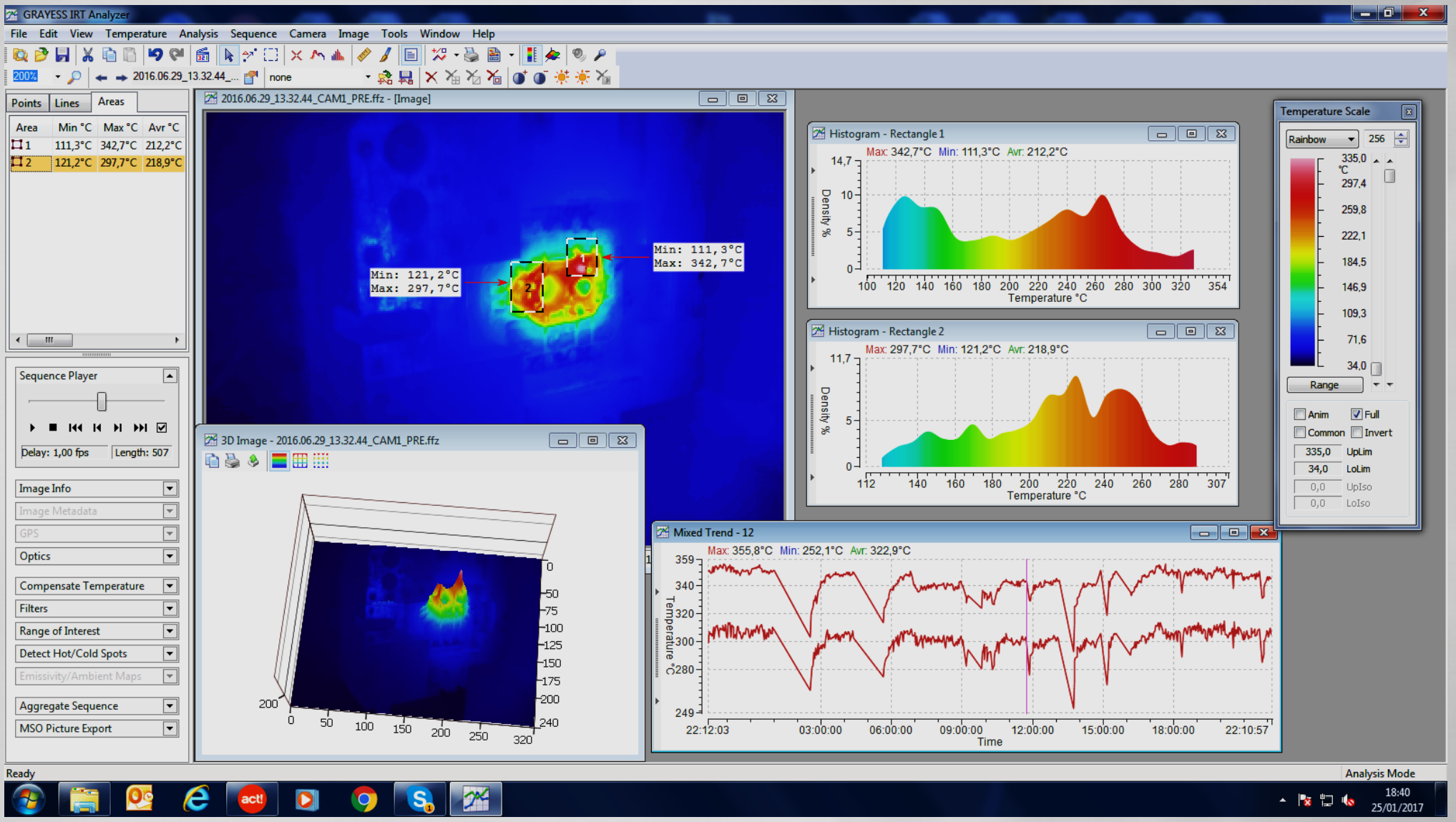


IRT - Analyzer software for PC



DTC – Case study #1

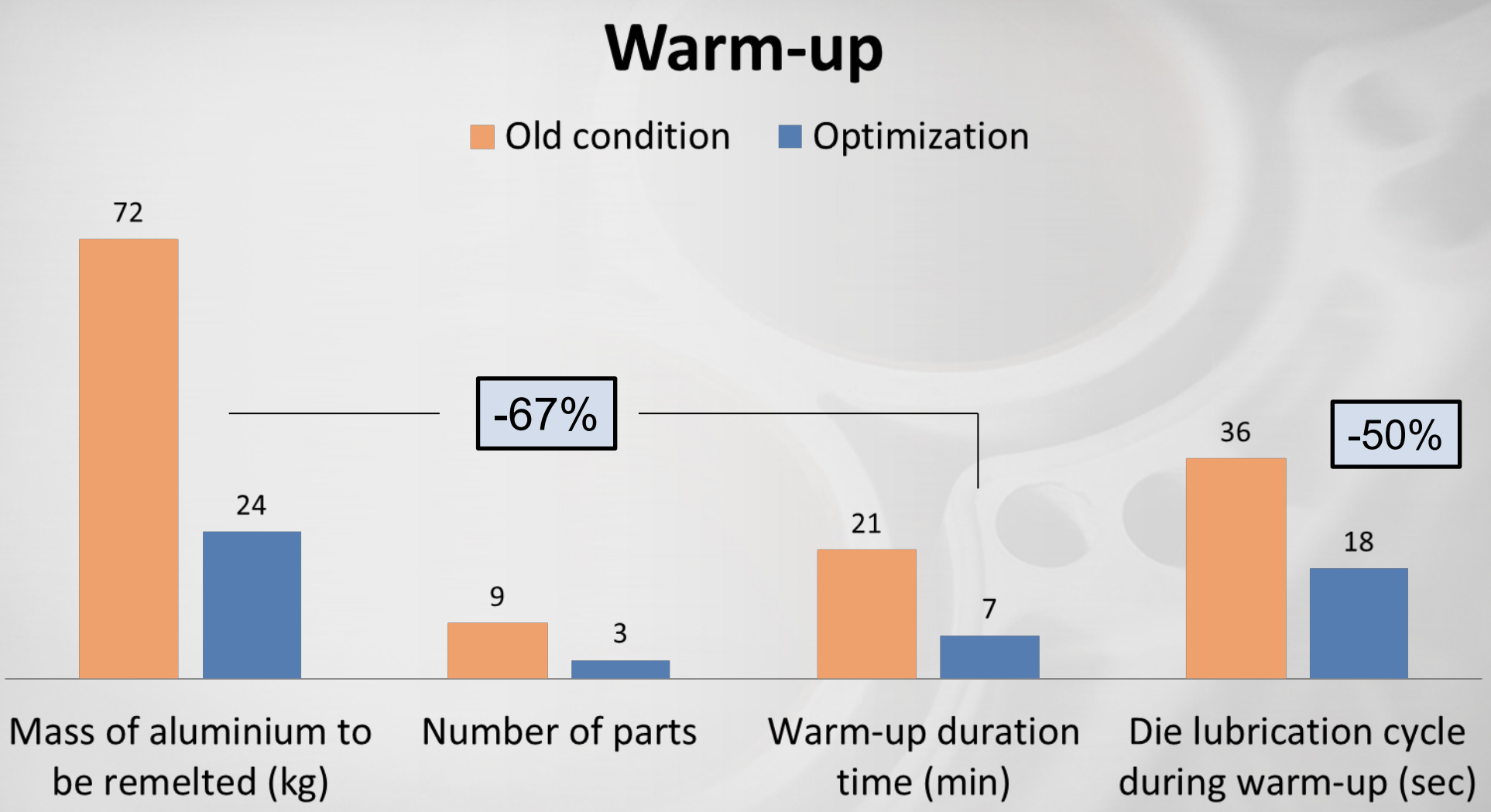
European Chem-Trend Customer

- Customer – Chem-Trend – Inprotec IRT
- Trial with interactive DTC – ABB
- Complex and heavy parts – 8kg GH

Main targets

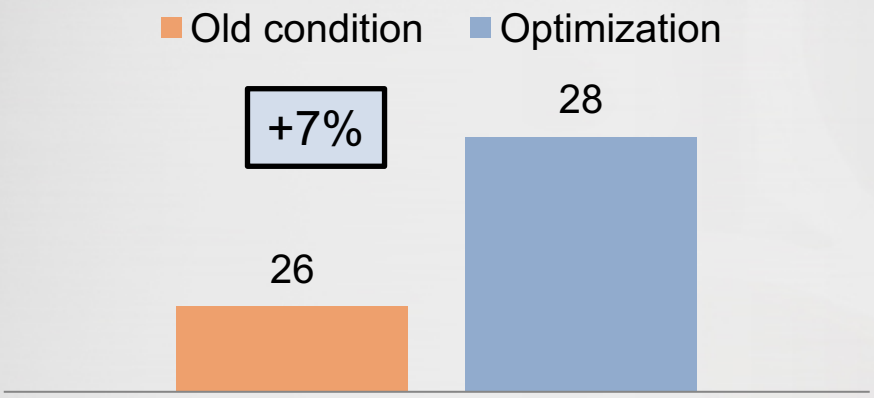
- Interactive control DTC-ABB
  - Avoid soldering and stopped machine occurrences
- Understand and define the best warm-up curve
  - Increase productivity and reduce scrap
- Improve OEE
  - Overall equipment effectiveness of the HPDC cell

Results


Warm-up
Old condition
Optimization
72
24
9
3
21
7
36
18
-67%
-50%
Mass of aluminium to be remelted (kg)
Number of parts
Warm-up duration time (min)
Die lubrication cycle during warm-up (sec)

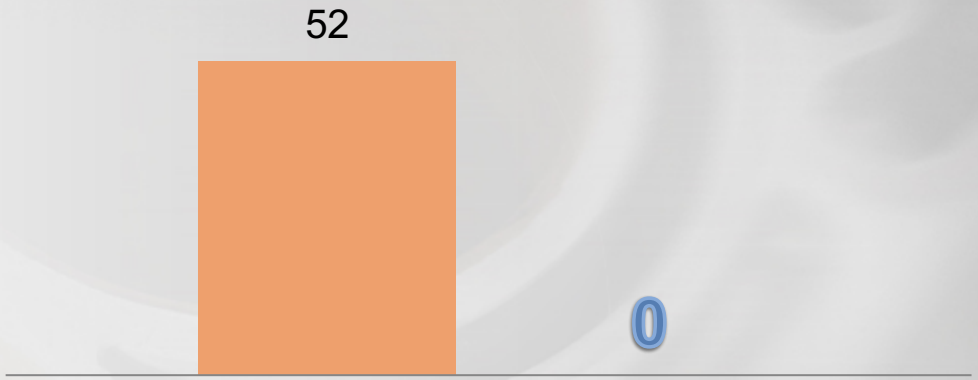
Results

Productivity



Number of parts produced per hour

Stopped machine - thermal reasons



Number of hours by month

- Estimated monthly cost for a 2,700 tons DCM stopped:
  - In 22 working days: 52 hours stopped
  - 150 €/hour (estimation from a DCM producer)
    - **TOTAL of approximately 7,800 €/month**

Results

- Good interaction between DTC-ABB Lubrication Robot
  - Variation of the lubrication cycle according to DTC alarm limits
- Reduction in the defect occurrences
- Optimization of the die lubrication cycle
  - Wastewater reduction
- Improvement of 3.5% in OEE
  - Overall equipment effectiveness of the HPDC cell

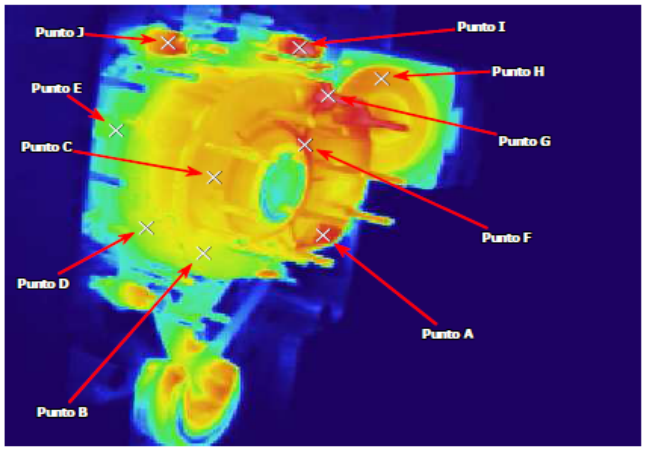
Conclusions

- The DTC is an «open» device:
  - Interface with peripheral devices is real
- The DTC is a monitoring device for the series production:
  - Productivity improvement
- Tailor-made on Customer's needs

DTC – Case study #2

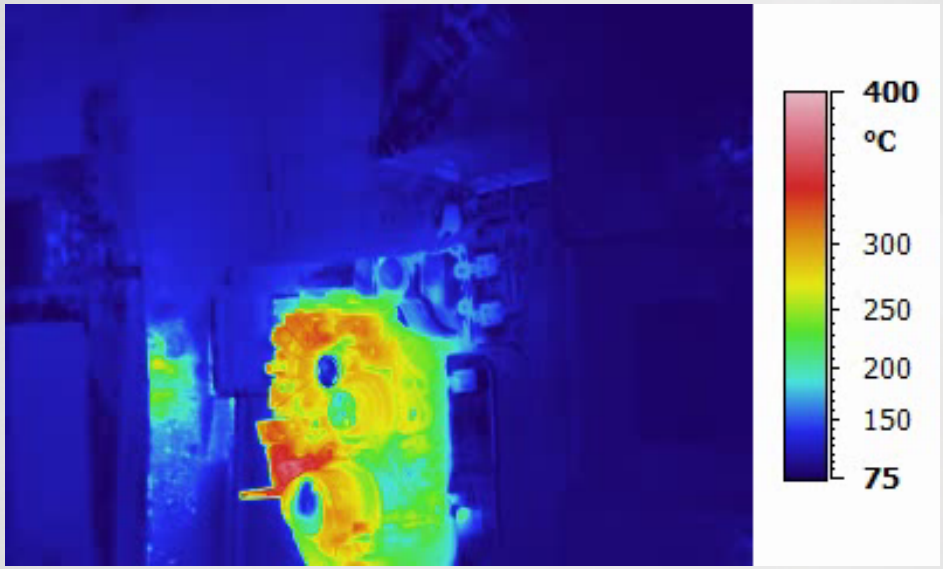
European Chem-Trend Customer

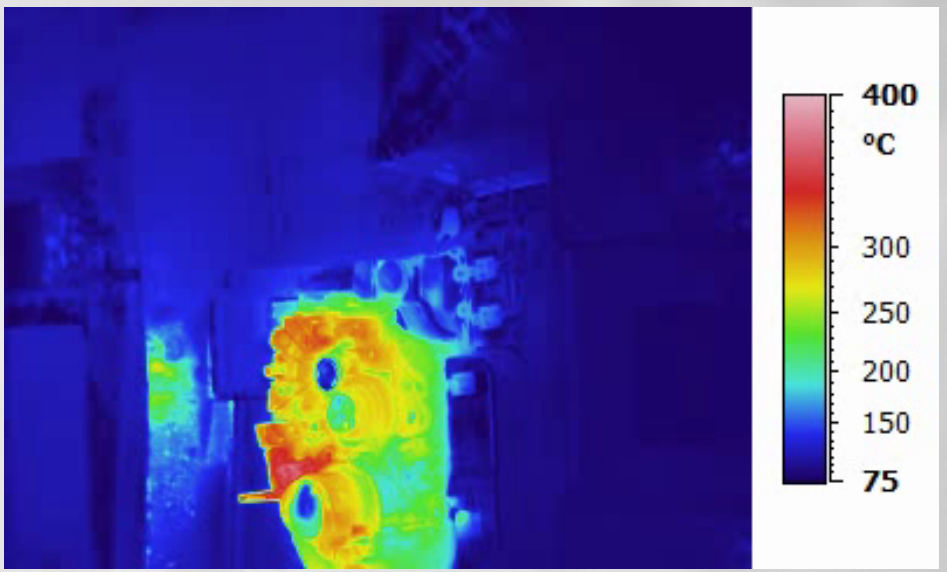
- Customer – Chem-Trend – Inprotec IRT
- Casting defects - surface temperature
- Complex and heavy parts – xxx GH

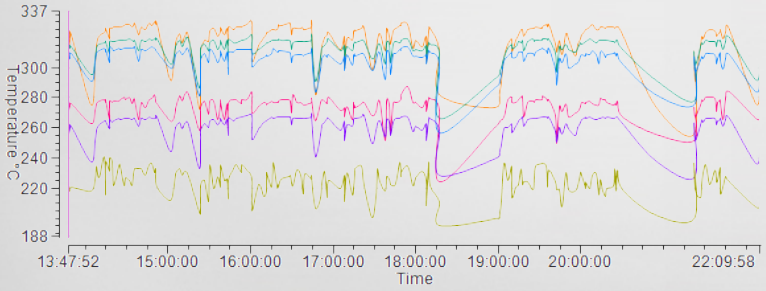


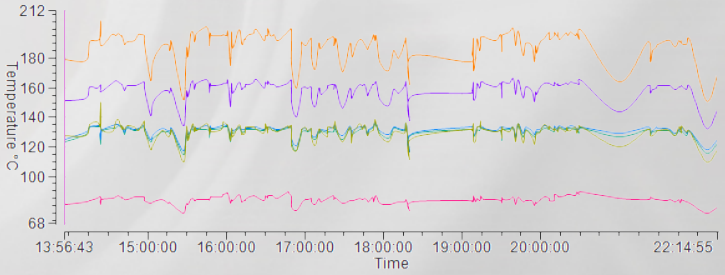
Monitoring and understanding

- Complete diagnostic



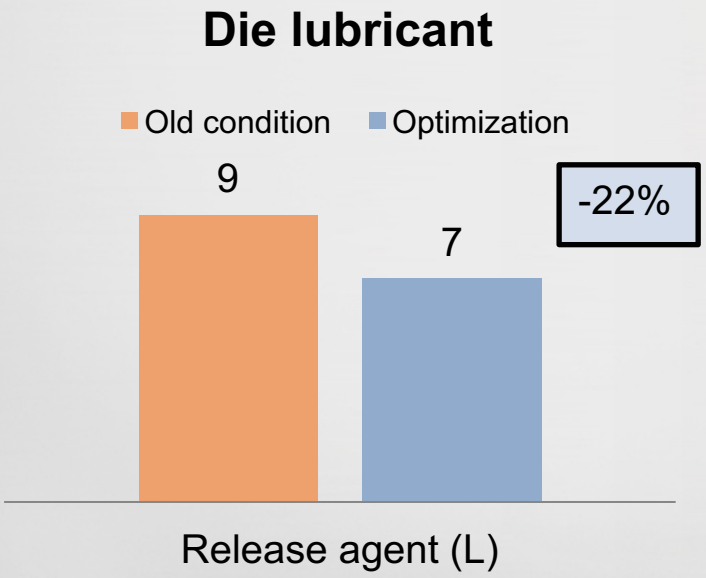


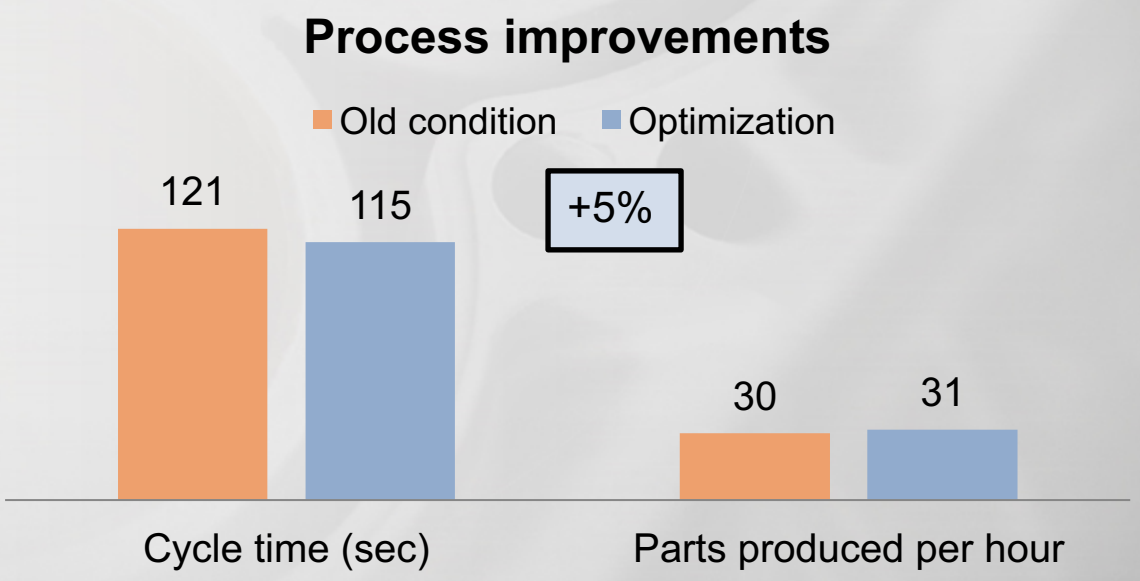




Results

Parameters	Old condition	Optimization	Variation
Average temp before spraying (ºC)	305	307	2
Average temp after spraying (ºC)	98	150	**52**
Temp variation Pre-Post (ºC)	**207**	**157**	**-50**





Results

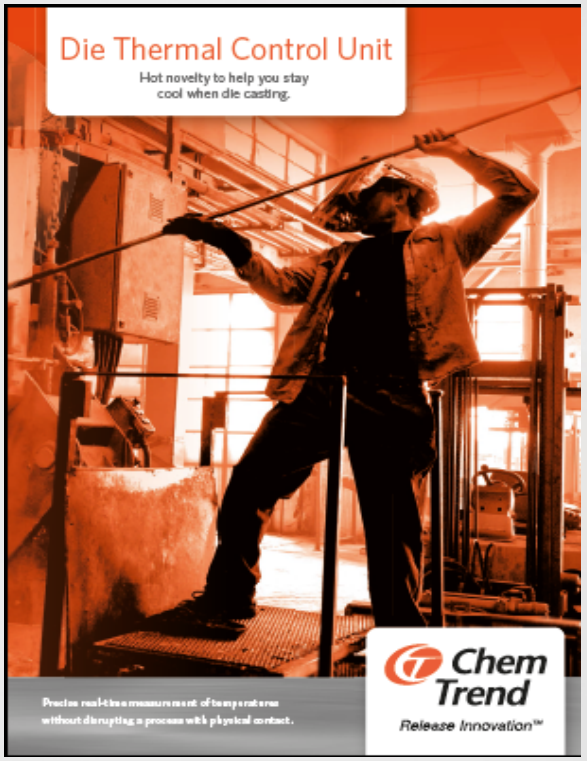
- Die surface temperature optimized
- Die lubricant reduced in 22%
  - Wastewater reduction
- Enhanced casting quality
  - The X-ray test showed markedly reduced pores
  - Cold flows, shrinkages and die-solderings, were eliminated
- Increased productivity in +5%
- Design of the spraying programs on other machines

Customer comments and conclusions

- *Monitoring and controlling the die surface temperature can result on fundamental process improvement*
- *The DTC device clearly showed the high benefit as a valuable tool to analyze production processes and to identify any potential optimization*
- *The results of the first project showed that the high benefit of the DTC will also pay off the investment in a short time*

Further informations

- Available in English, German and Italian Language



Dedicated Website for the DTC (multi-languages)

www.diethermalcontrol.com

DTC by INPROTEC IRT

- Infrared specialists:
  - Hardware & Software development department
  - 100% dedicated resources for tailor-made systems
  - Prototypes
  - Series production
  - Service & Maintenance
  - Spare parts

http://www.inprotec-irt.it/


Thanks for your kind attention!
Chem Trend