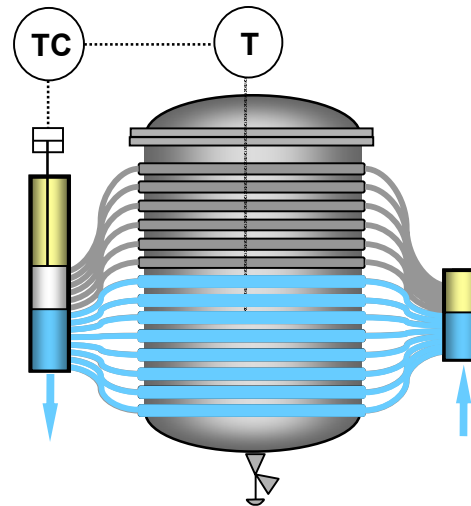


Ashe Morris Constant Flux Reactor

Test results

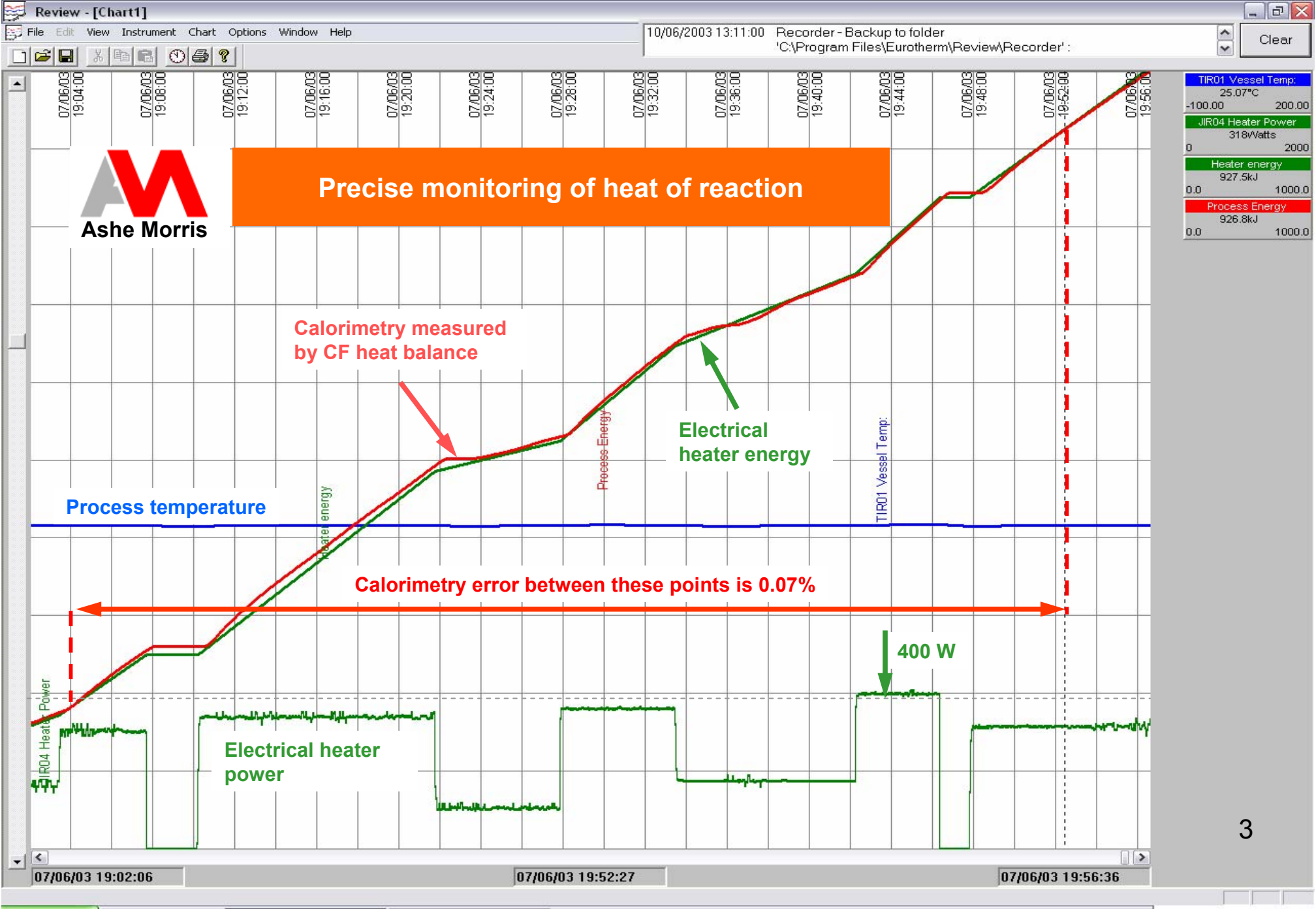
June 2003

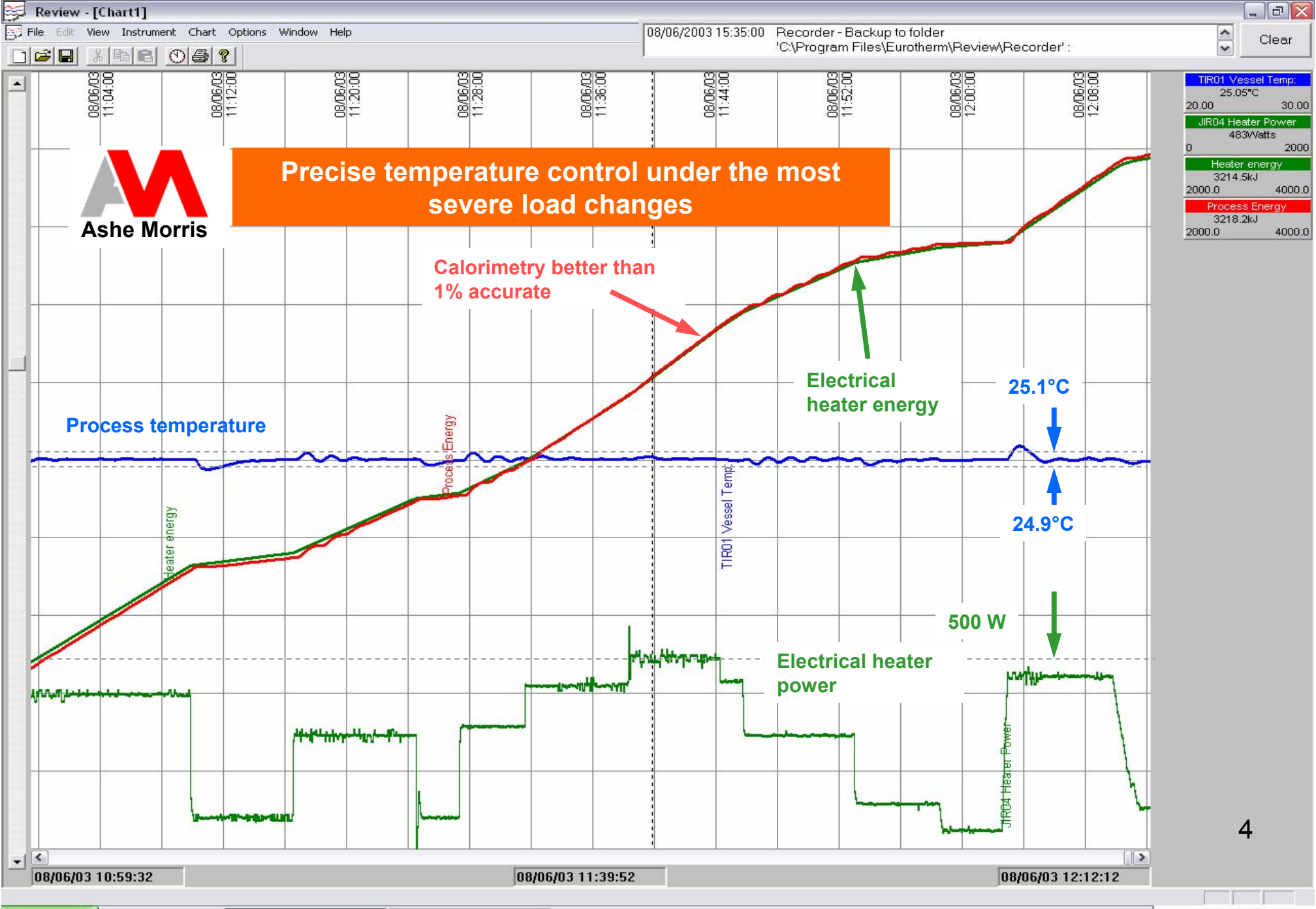




Introduction

- These are test results for a 10 -15 litre Hastelloy constant flux batch reactor. They illustrate:
 - Improved temperature control
 - Accurate calorimetry
- Water was used as the process fluid
- The cooling fluid was water/ethylene glycol (~50:50)
- A tantalum heater (with accurate power meter) was used to simulate heat of reaction within the process fluid
- Only simple ‘zero calibration’ was conducted to establish system gains/losses.

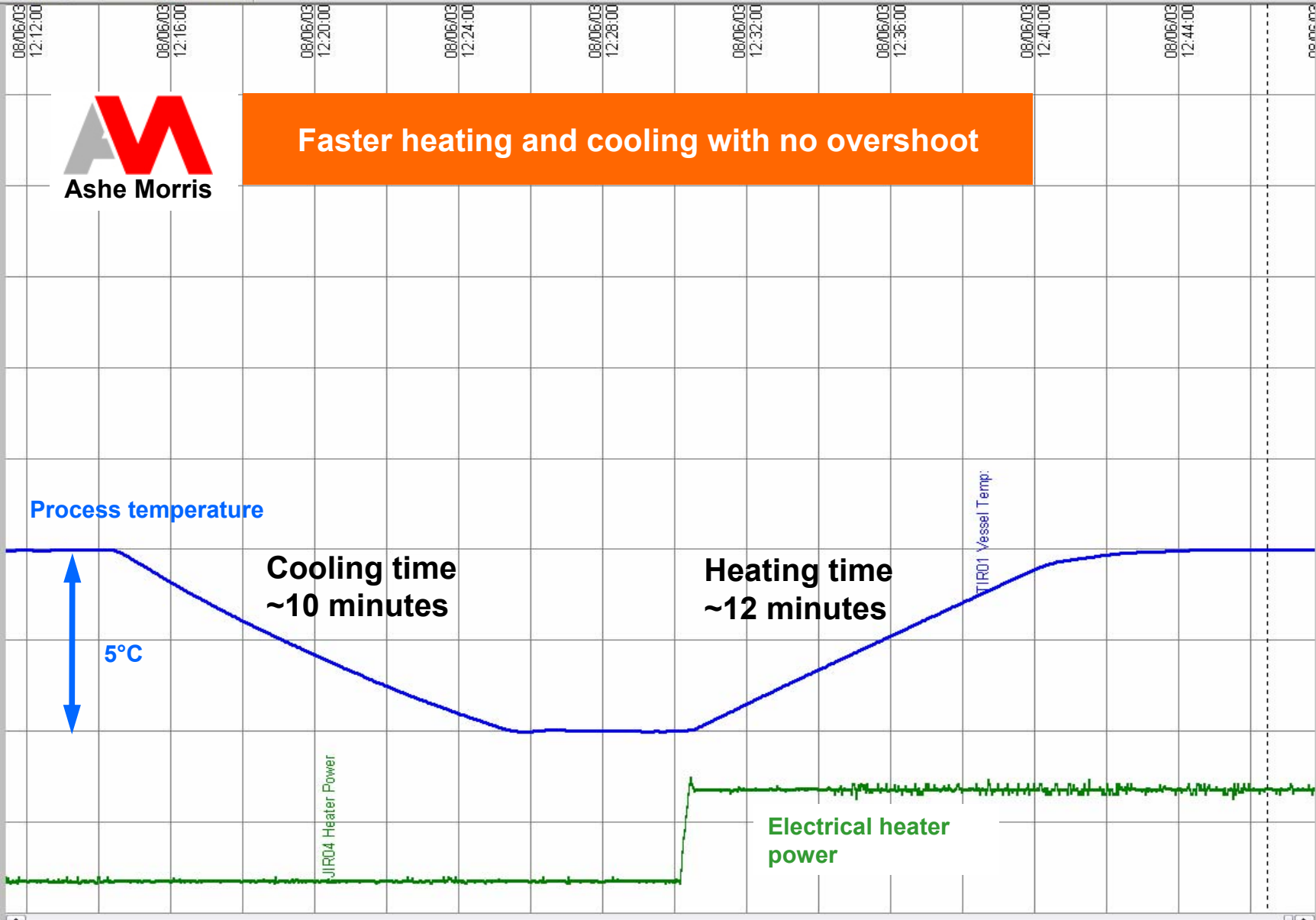






Faster heating and cooling with no overshoot

TIR01 Vessel Temp:	25.02°C
JIR04 Heater Power:	410Watts



Process temperature

Cooling time
~10 minutes

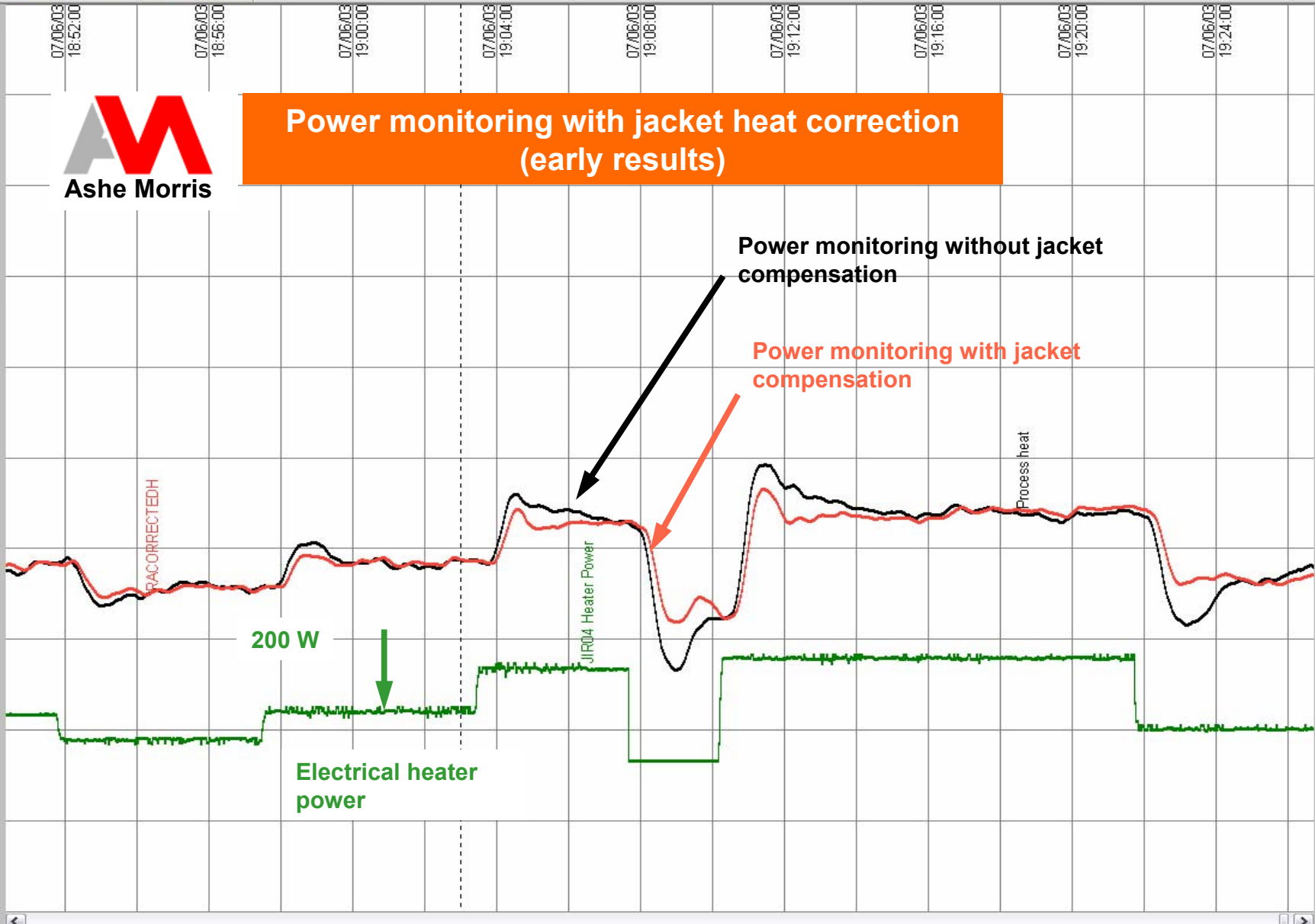
Heating time
~12 minutes

5°C

Electrical heater power



Power monitoring with jacket heat correction (early results)



JIR04 Heater Power	176Watts
Process heat	164Watts
RACORRECTEDH	166W



Conclusion

- Constant flux delivers unparalleled performance
 - Very accurate heat measurement (accurate to within $\pm 0.1\%$ in some tests)
 - Precise temperature control under the most severe load changes (generally better than $\pm 0.1^\circ\text{C}$)
 - Good power monitoring – with further improvements expected
 - Fast heating and cooling with no overshoot
- Constant flux is a much simpler calorimetry technique
 - No time consuming set-up (just turn on and use)
 - No calibration (other than for background system losses)
- Constant flux offers a fully scalable solution
 - For the first time, accurate calorimetry can be utilised through scale-up and manufacturing
 - Accurate on-line monitoring can be used to improve process performance