Presentation to SIMTEC 2008

Improved Vacuum Pan performance using Jigger Tubes

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The use of a novel jigger system to improve vacuum pan performance

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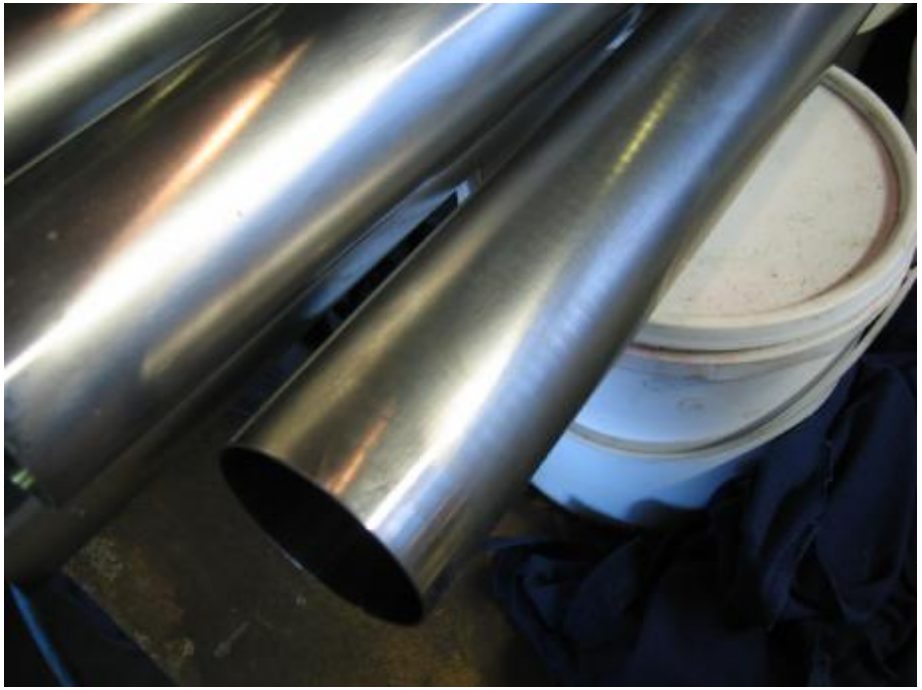
Introduction

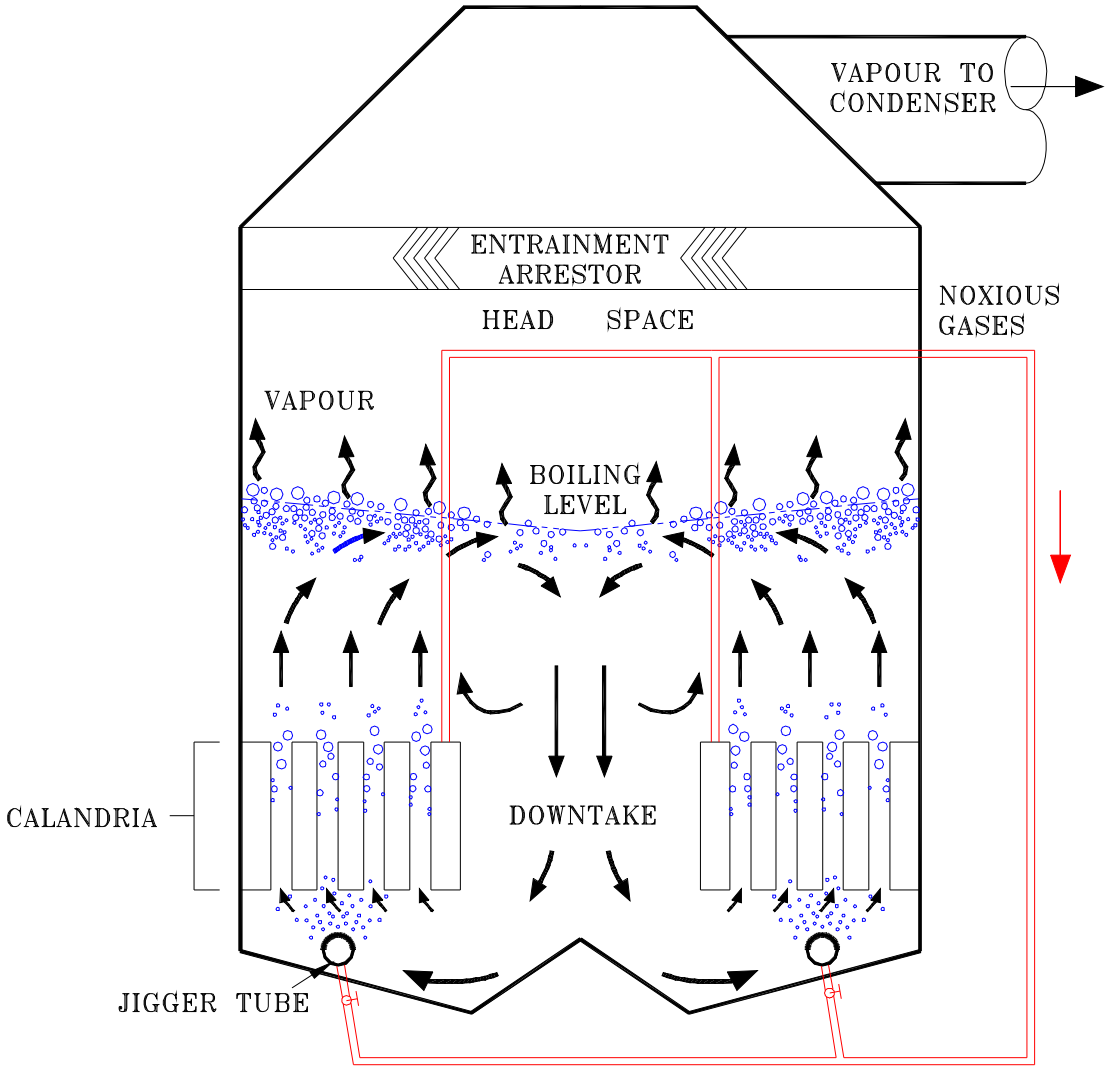
- Jigger system uses incondensible gases/vapour injected into base of pan under the calandria to improve circulation and heat transfer
- Designed to uniformly distribute injected gases through very fine perforations. Install jigger tubes as
  - Ring for batch pans
  - Axial pipe/s for horizontal continuous pans

SRI jigger tubes

- Laser drilled stainless steel tube
- Holes of 0.2 mm diameter at intensity of 100,000 holes per metre

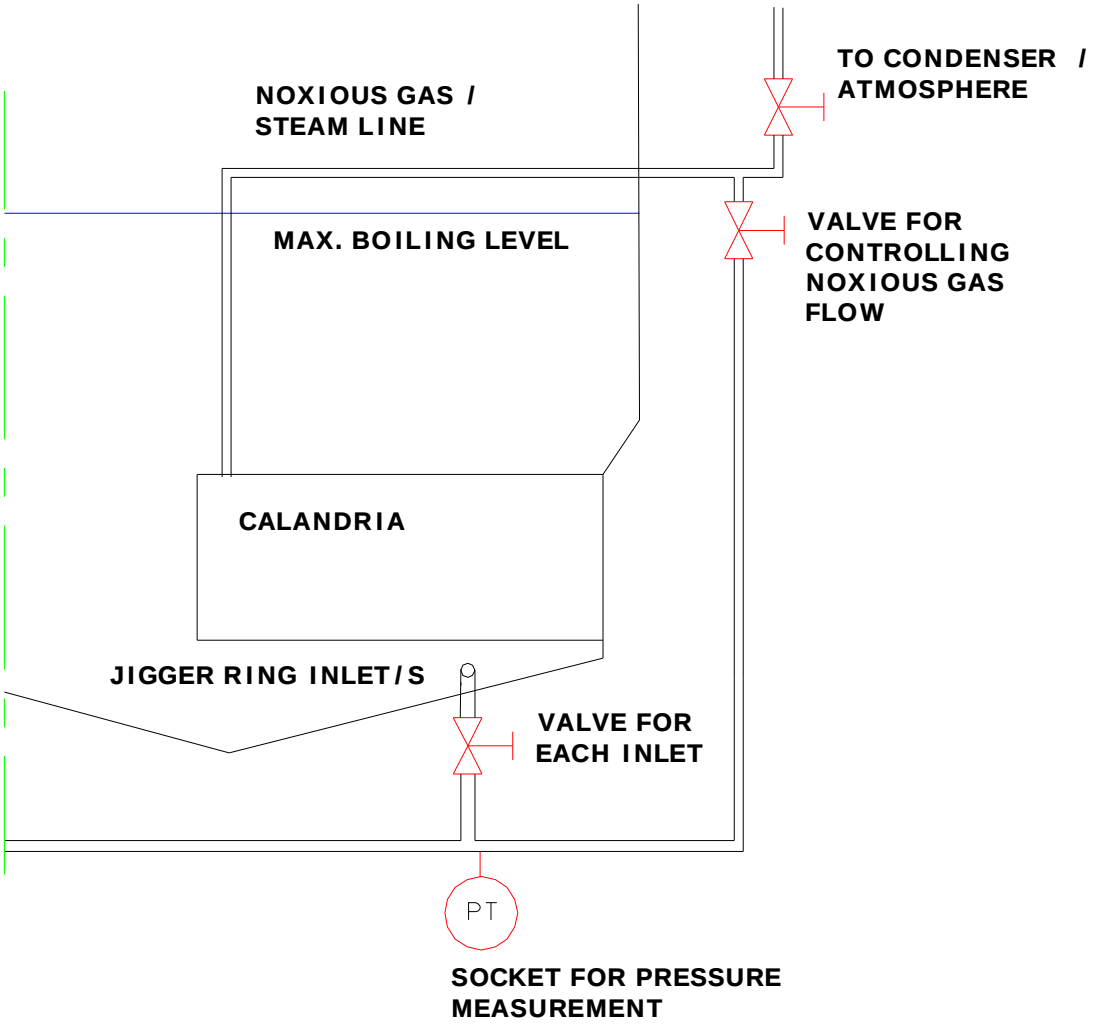


Effect of noxious gas jigger on circulation



Jigger system design

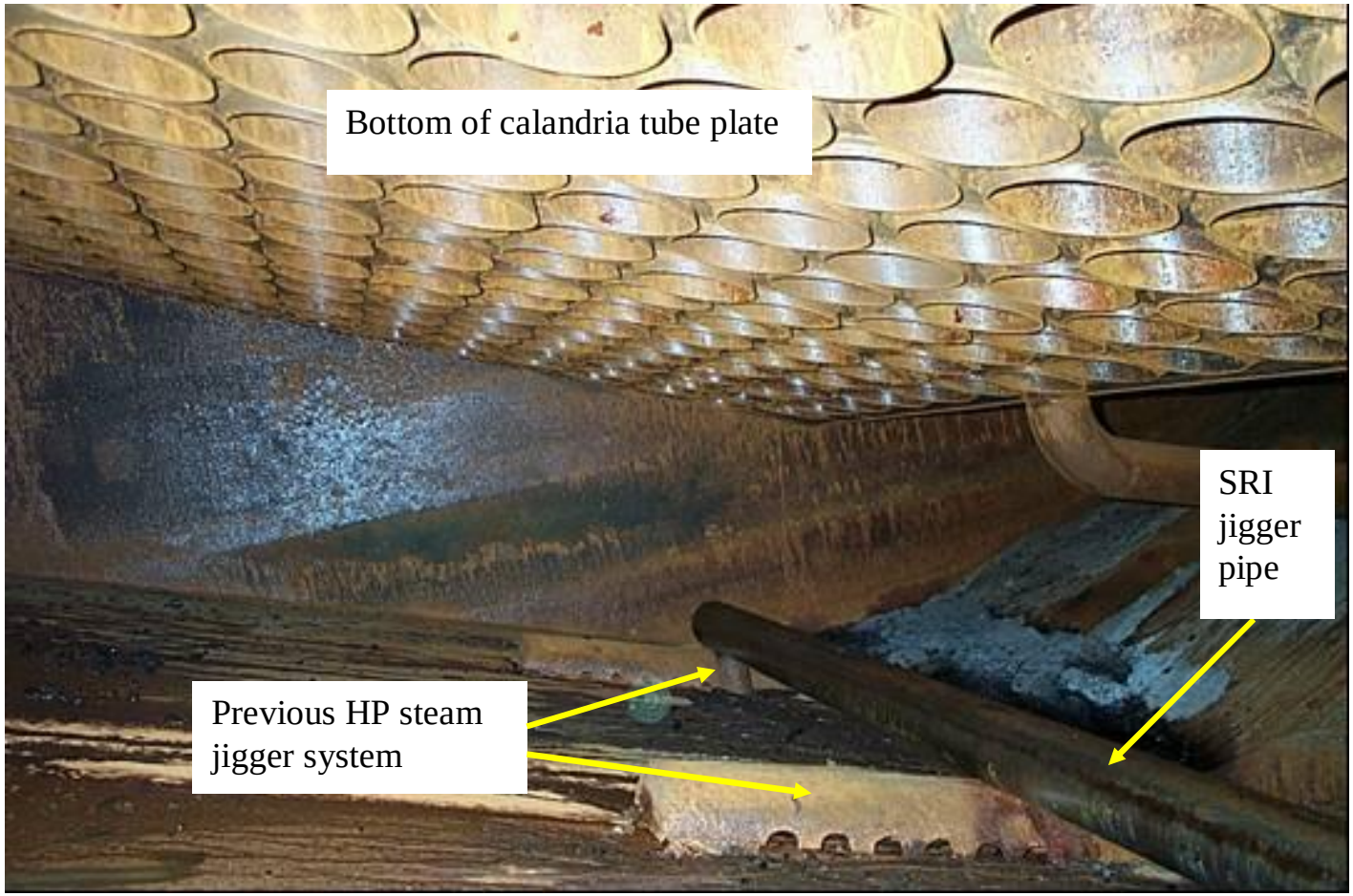
- Simple installation
- Controlled by manual valves and set to achieve required pressure differential (typically 15 to 20 kPa)



Factory applications, testing and experience

- First installation in continuous C pan at Tully Mill, Australia in 2003 season
- Comprehensive testing in 2004 and 2005 seasons
  - 200 t batch A massecuite pan (Kalamia)
  - Continuous A massecuite pan (Tully)
- Installed in 6 batch pans and 7 continuous pans for the 2007 season

Continuous pan installation

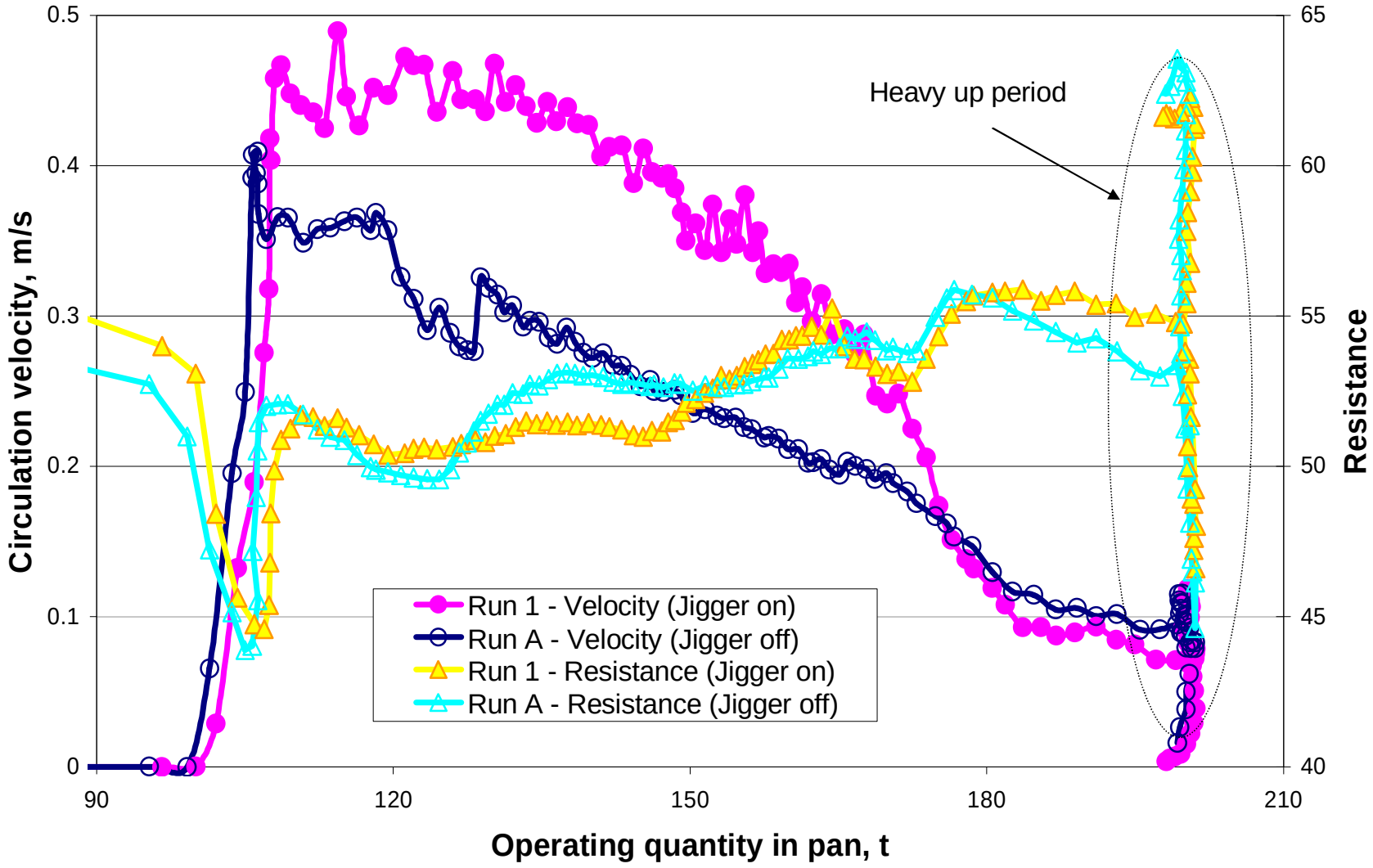


Results – 200 t batch pan

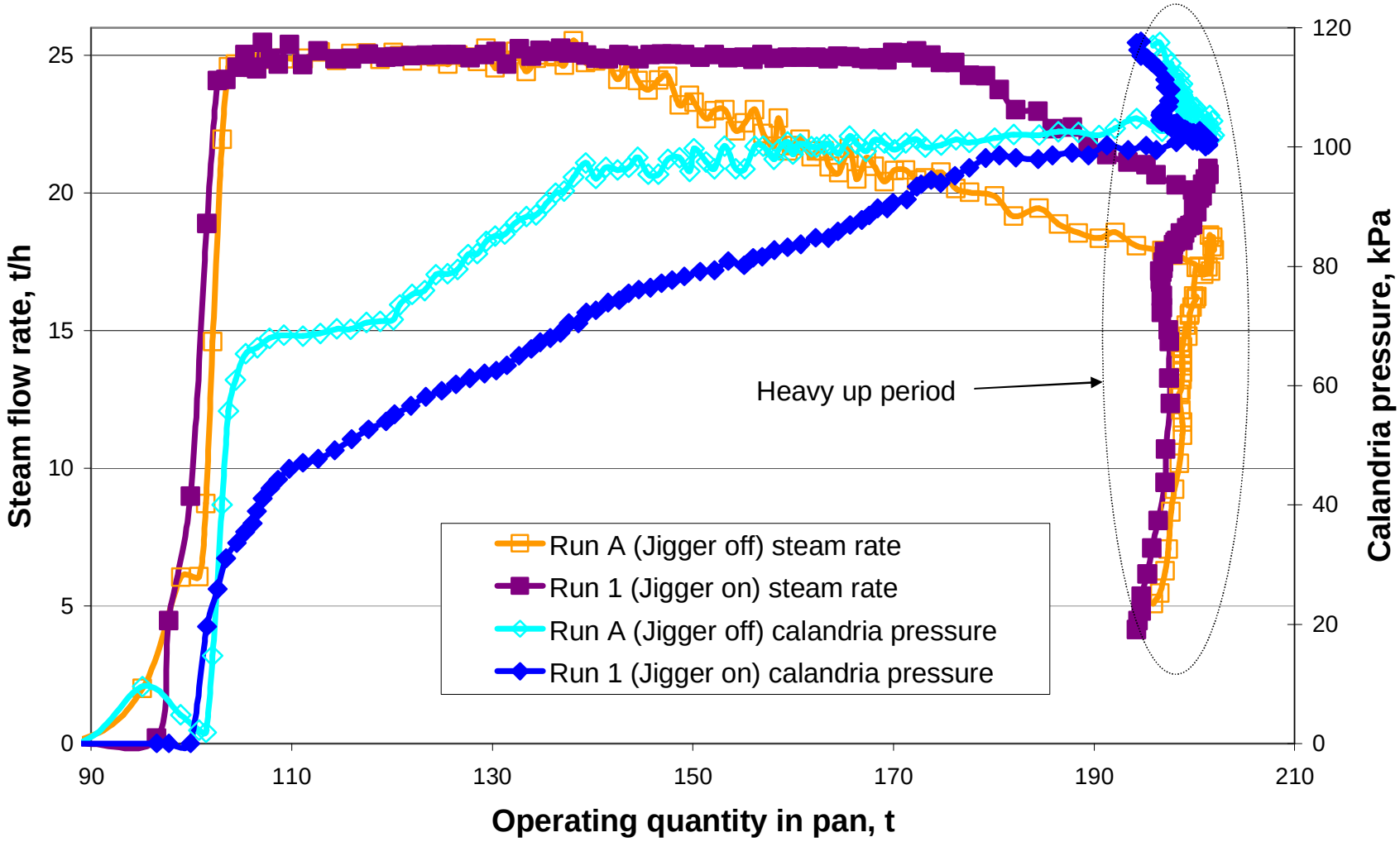
- Improvements in average circulation rates (up to 20%)
- Reduction in calandria pressure of

  20 – 40 kPa
- Improvements in HTC’s (5 to 30%)
- Reduced average steam flows
- Shorter cycle times

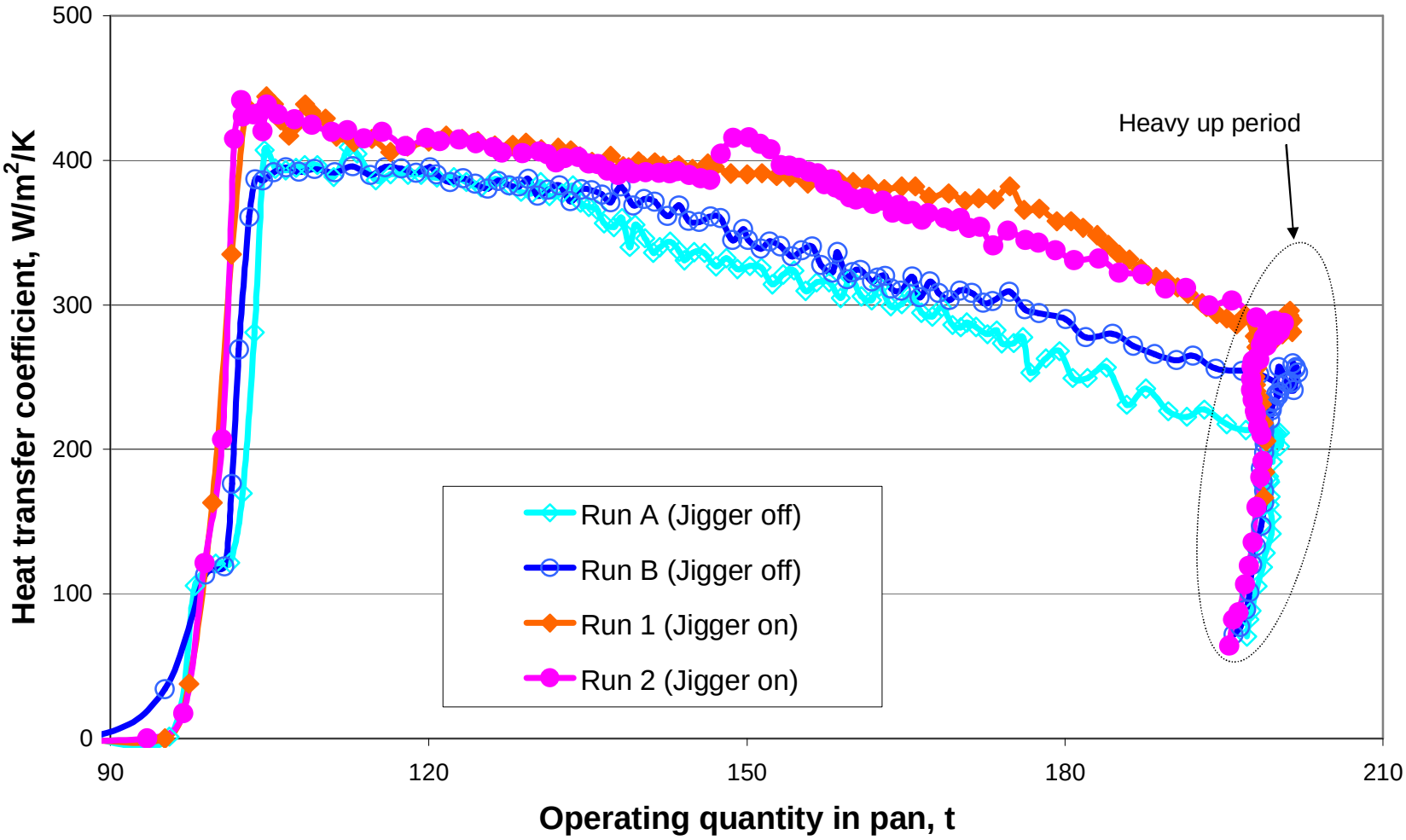
Results – 200 t batch pan
Circulation velocity



Results – 200 t batch pan
Steam flow rate and calandria pressure



Results – 200 t batch pan
Heat transfer coefficient



Results – Continuous A pan

- Improvements in circulation (up to 15% increase in measured velocity)
- Quantity of slow moving massecuite on the pan base reduced
- Slight reduction in calandria pressure

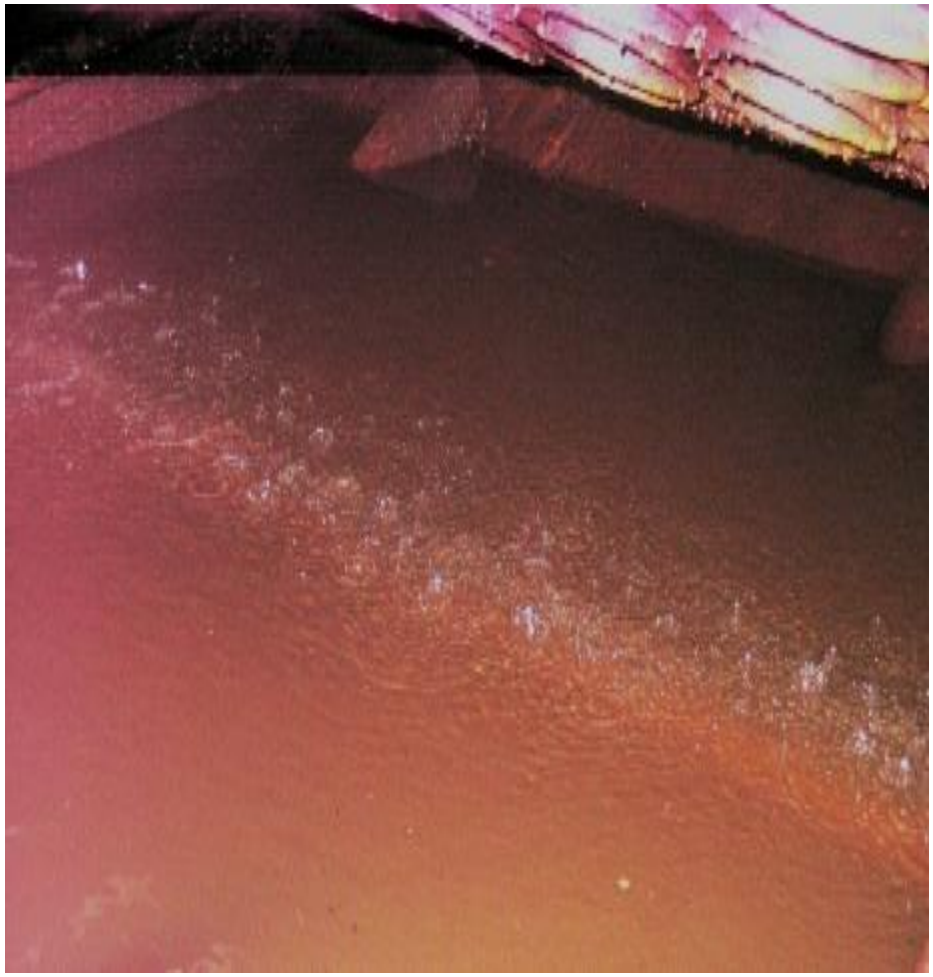
Feedback on improvements to batch pan performance

- B pan operates on 12 minute shorter cycle time
  → benefit to other pans in the schedule
- Eliminate use of defoamer in magma pan
- Reduced calandria pressure, allowing higher steam rates at high massecuite levels
- Much improved circulation at pan full, better control and heavy up
- Eliminated problems of jigger steam pipes becoming blocked with massecuite

Feedback on improvements to continuous pan performance

- Higher dropping brix (increase by 0.6 unit for a C pan); plus more consistent brix
- Increased circulation → tighter control on conductivity
- Longer operating time between cleans (High grade seed pan previously cleaned every 10 days now cleaned after 14 days)
- Tubes and base of pans are faster to clean during a boilout (less sugar to remove)
- More rapid restart after stopping pans with massecuite at the operating level (e.g.during factory breakdown)

Check on operation of the jigger tube after 15,000 hours



Air test into jigger in Tully C pan after operation for 15000 hours (during 4.5 seasons).

Pressure drop 20 kPa

Check on operation of the jigger tube after 15,000 hours

Air test into jigger in Tully C pan after operation for 15000 hours (during 4.5 seasons).

Pressure drop 50 kPa

Other features of the new system

- Low installation cost (installed by mill tradesmen)
- Minimal operator intervention
- No special cleaning requirements
- Pipes do not block with massecuite
- Non return valves not needed
- No additional gas load on the condenser or vacuum pump

Able to retrofit to batch or continuous pans

New installations for the 2008 season

- Batch and continuous pans
- Four pans in Australia
- Pans in Argentina, India and South Africa

Acknowledgements

- Tully Mill staff
- Kalamia Mill staff
- Queensland Sustainable Energy Innovation Fund
- Board of Sugar Research Institute, Australia. SRI owns the intellectual property for the jigger tube system.