The effect of downtime on required plant capacity

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Issue

- Each sugar factory has to have enough installed capacity to process its crop within its desired season length
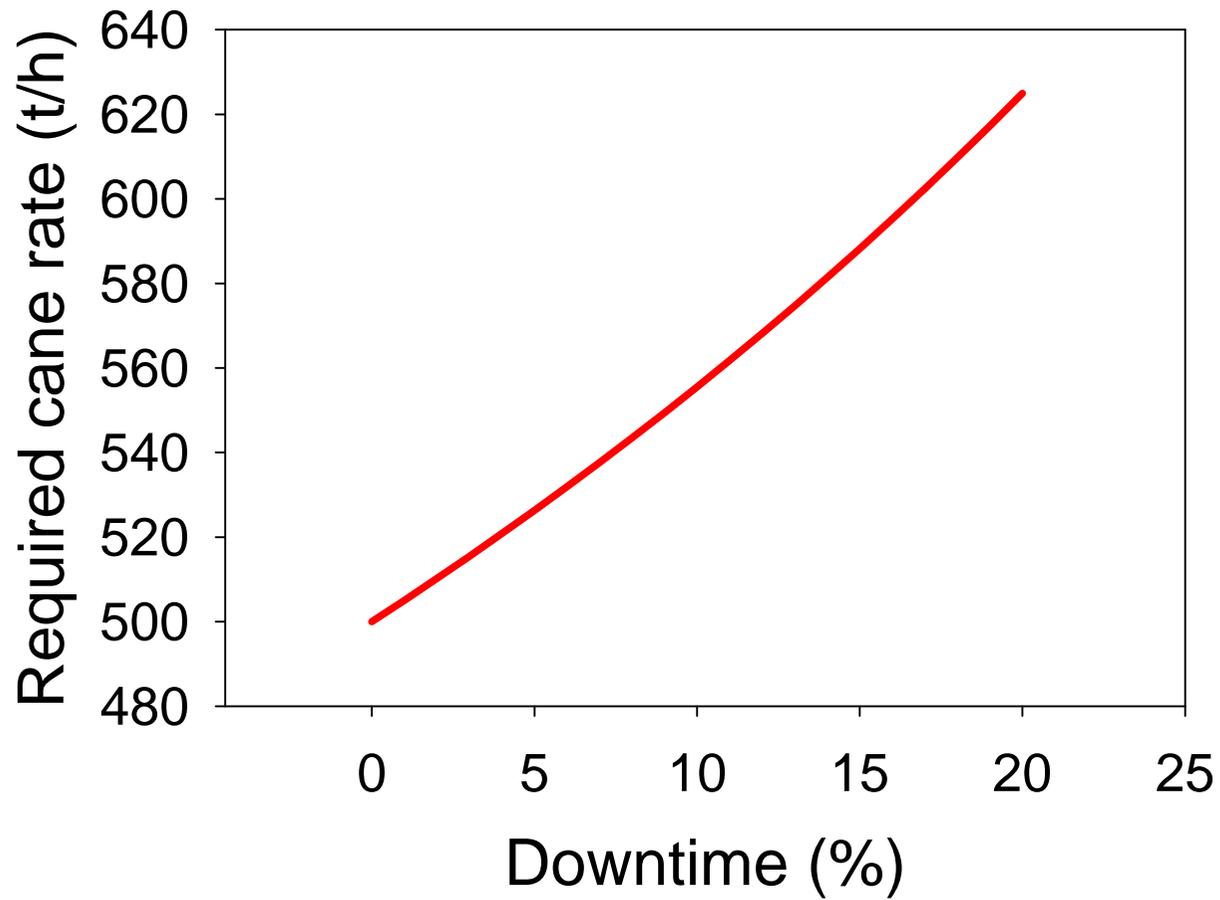
Downtime

- Downtime reduces the effective season length
- Requires extra installed capacity to process the crop in the shorter time period
- Downtime in Australian factories differs significantly from site to site but is typically about 11% of total time

Cane rate

- In Australia, normally define cane rate in tonnes of cane per hour of crushing time
  - Downtime does not appear in rate figures
  - Also report weekly cane crushed which does take actual downtime into account
- Many other places define cane rate in tonnes of cane per day
  - Sometimes include an allowance for downtime

For a 12 000 t/d factory

What can be done about downtime?

- Causes of downtime
  - Cane supply
  - Factory availability
- Cane supply out of the hands of factory engineers

Improving factory availability

- Effective asset management strategies
- Constrained by available resources
    - Budget
    - Labour
   - Inventory of spares and consumables

Objectives

- Reduce risk of failure in service

- Reduce maintenance duration

- Allocate maintenance resources where they will have the most benefit in reducing downtime

Questions

- How long can an asset's operation be extended if it is not maintained?

- What effect does maintenance have on the probability of failure and Mean Time To Failure (MTTF)?

Predicted reliability with time based maintenance
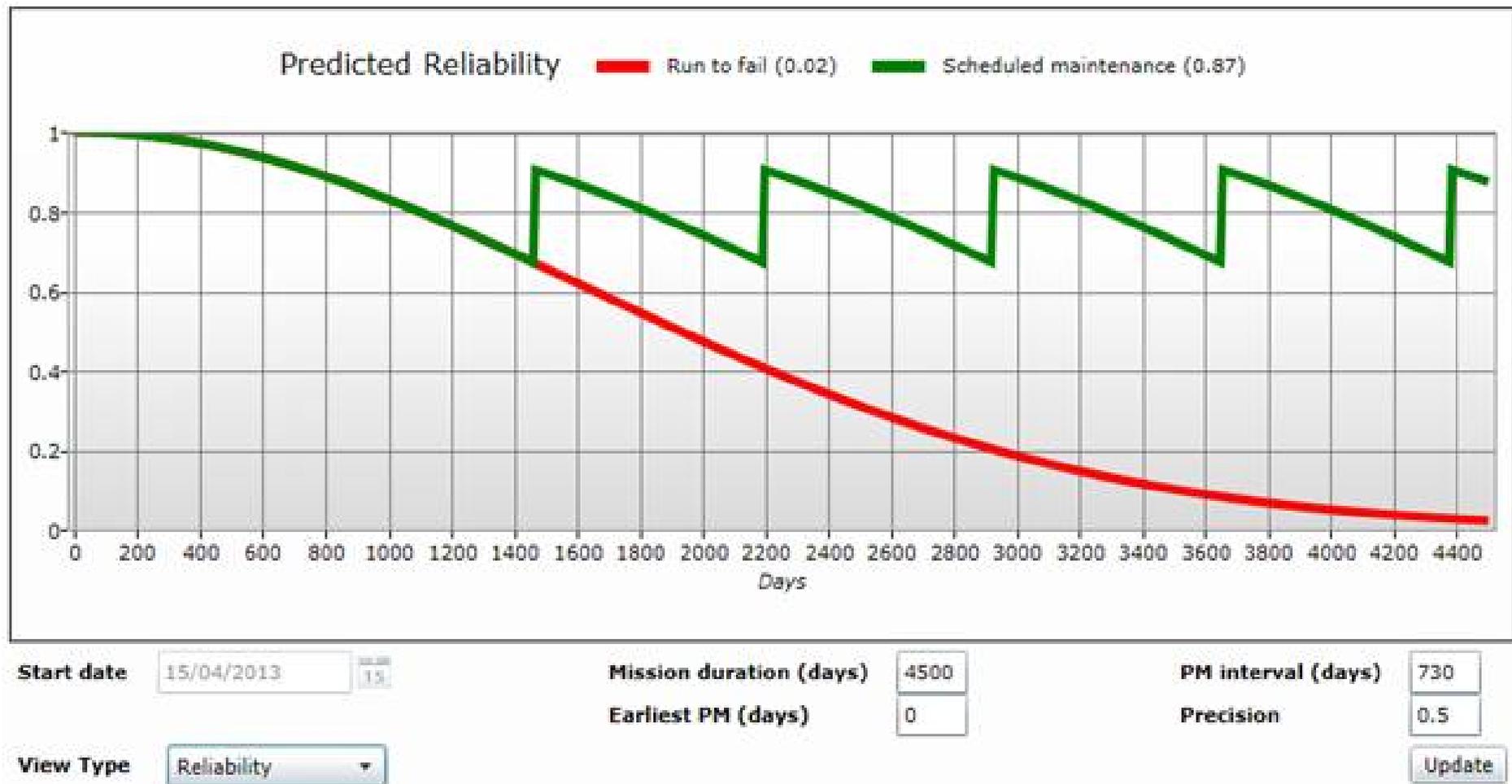
Optimal maintenance costs

Challenge

- Given that maintenance resources have to be spread across all assets, how to allocate those resources between assets to minimise factory downtime

Approach

- Take a scientific approach
- QUT has long term experience in operations and maintenance optimisation and asset management
  - Host to The Asset Institute, formerly CRC for Infrastructure and Engineering Asset Management (CIEAM)

Developed software (HAMISH)

- Algorithms for
  - Reliability modelling
  - Condition monitoring
  - Operations and maintenance decision making
  - Advanced data analysis

Current Algorithm Libraries for HAMISH
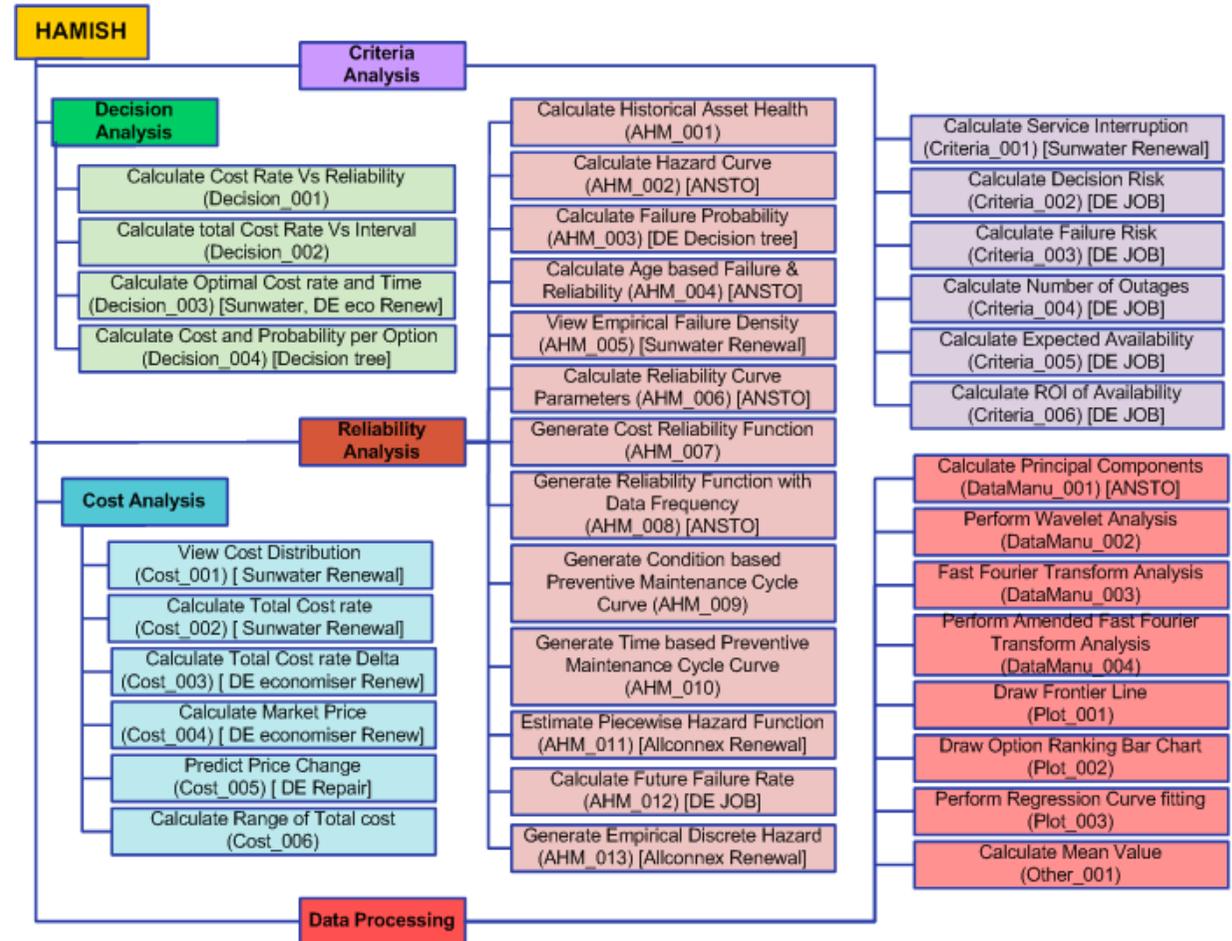
Current status

- Seeking funding to apply these developed techniques to the sugar factory

Benefits from productivity increase and maintenance cost decrease

Optimised machine maintenance	→	Less stops (=more availability)	→	Better functioning of the crushing process
↓		↓		↓
Reduced maintenance costs		More cane crushed and less costs for the whole chain (labour costs, waiting times, agronomic costs)		More sugar for each ton of cane (recovery)