Energy efficiency/savings at Atlantis Foundries

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May 2022

Presenter bio…

Andre Arendse

Training…
- Electrical: Ndip. Elec Eng. (HC, Automation & Control)
- Mechanical: S4
- GCC – Factories

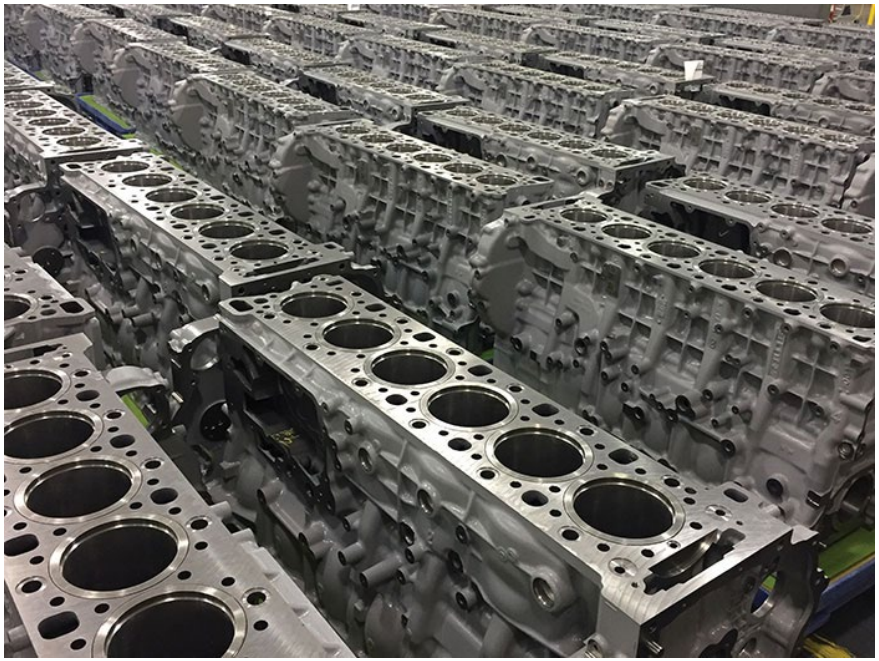
Employment…
- Plant engineer at Atlantis Foundries
- Employed since 2010

Duties include…
- Automation tasks
- Substation maintenance
- Project consulting

Newer activities…
- Energy efficiency
- Power quality

About Atlantis Foundries…

- Manufactures engine castings
- Part of the Daimler group, Truck division
- In operation since 1982 (was known as ADE)
- Situated in Atlantis, Western Cape
- 800+ employees
- NMD of 31MVA, supplied at 11kV



Interventions implemented – LED lighting

Normal first step

Advantages…

- More efficient than incandescent and discharge lighting technologies
- Longer operating hours

Disadvantages…

- Higher initial cost
- More prone to propagate voltage flicker, which contributes to ‘sick building syndrome’

Interventions implemented – Maximum demand control

- AF is on the '*Time Of Use'* tariff, which have the following features…
  - Energy is cheaper or more expensive, depending on when you require it.
  - The max demand for a given month is only assessed during the *'peak'* and *'standard'* times.
- A max demand controller was commissioned to only allow usage up to NMD during *'off-peak'* times.

Note:
This does not necessarily reduce the amount of energy used for a given month, because load shifting is performed.
The saving is realised through the decrease in demand payments.

Interventions implemented – Power factor correction

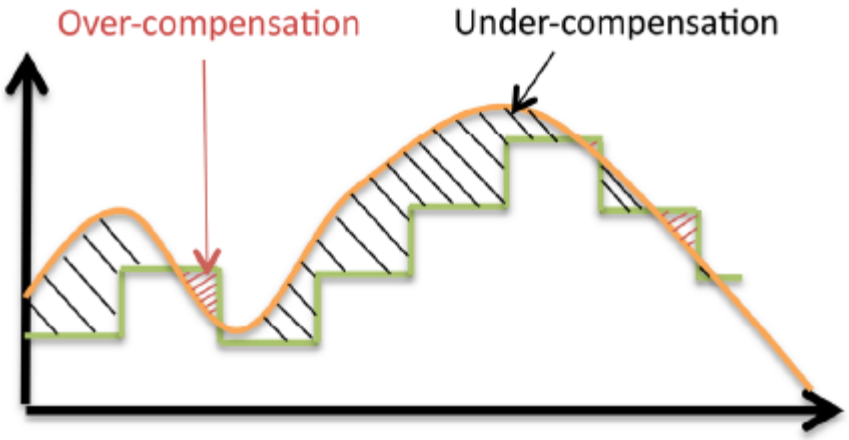
- PFC reduces the amount of power required from supplier.
- Better technologies than the traditional *'fixed step'* PFC exists.
- Several Static VAr Generators (SVG's) were installed.

Advantages…

- Continuously variable response, no switched steps
- Low maintenance
- Quicker payback period
- Less space required
- Immune to, and does not amplify harmonics

Disadvantages…

- Higher initial cost
- Generates heat. AC likely required



Interventions implemented – Cooling tower fan control

- Fans are normally on when the CT is in use. This causes the ΔT to go too low, which is not good for the process.

- *Solution:* The ΔT is monitored. Soft-starters were installed to switch fans off when not required.

Interventions implemented – Dust extraction motor speed control

- Motor and impeller dimensions oversized – normal engineering practice when too little data is known upfront.
- Dampers were used to regulate suction – additional loss to be overcome by the motor.
- Affinity laws indicate that there's a cubed relationship between power and fan speed.

$$\frac{P_1}{P_2} = \left(\frac{N_1}{N_2}\right)^3$$

- VSD's were installed to control speed at optimal setpoint.
- Implemented on 2x 132kW, 1x 200kW, 1x 160kW motors.

Interventions implemented – Compressed air monitoring

- Leaks were identified and fixed.
- Benchmark/baseline was established.
- Trends are compared to benchmark to determine if intervention is required.

Interventions implemented – Active harmonic filter

Harmonic pollution has the following effects…

- The lifetime of nearby equipment is reduced.
- Equipment (motors) draw more energy than required.
- Transformers and cables run hotter than required. This heat energy has to come from somewhere

Achievements…

Project implementation and assessment period: 2012-2019

- Total energy saving claimed: 28,4GWh
- Tax allowance claimed (R0.95/kWh): R26,9m
- SARS rebate: R7,4m

Process journey…

- AF approached AIDC
- AIDC referred AF to NCPC
- NCPC arranged for a site inspection – report with recommendations issued
- AF approached M&V for project registration, verification, and 12L SARS application
- M&V based application on the *'whole facility approach'* as other projects were also implemented that had an indirect effect on energy usage
- SANEDI issued 12L Energy Efficiency Tax Certificate (rebate)

Next steps – identify loops where PID control can be implemented

- It is well known that, compared to on/off control, PID control is better for process control.
- Less emphasised is that PID is also good for energy/resource efficiency as only the amount of energy/resource required is injected into the process.

Places to implement…

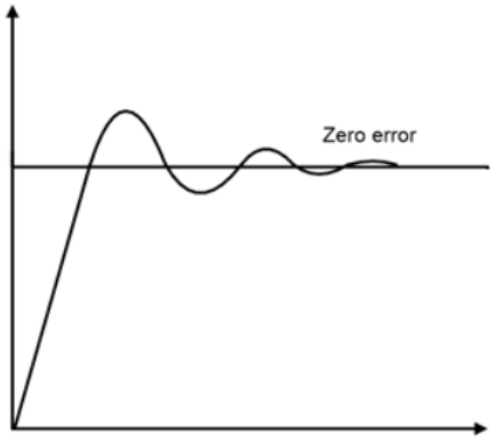
- Electric and gas heating applications
- Dosing systems

Advantages…

- Stable process parameters.
- Optimal energy usage

Disadvantages…

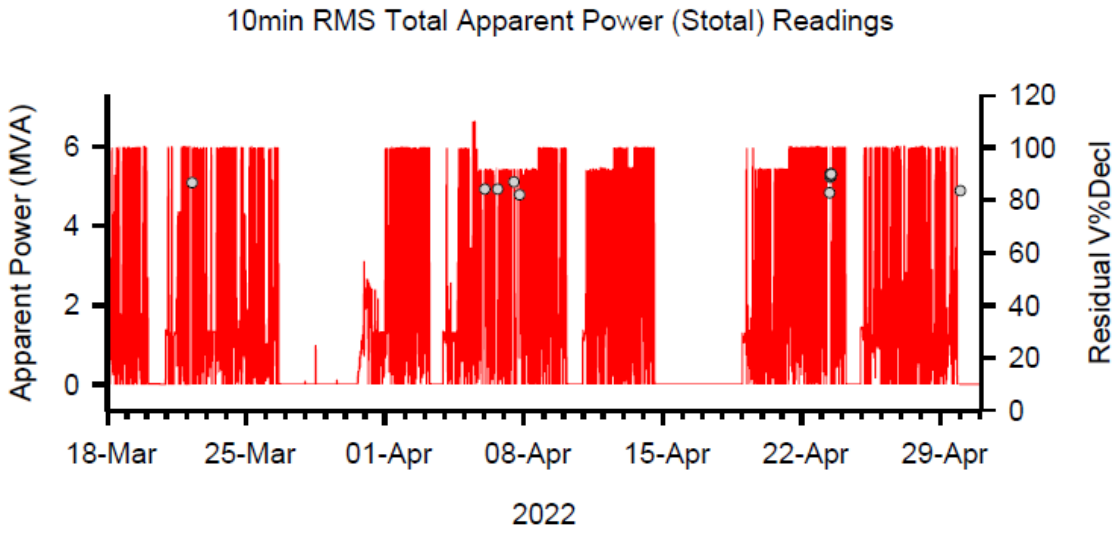
- More complex to implement and troubleshoot
- Can make situation worse if not done properly

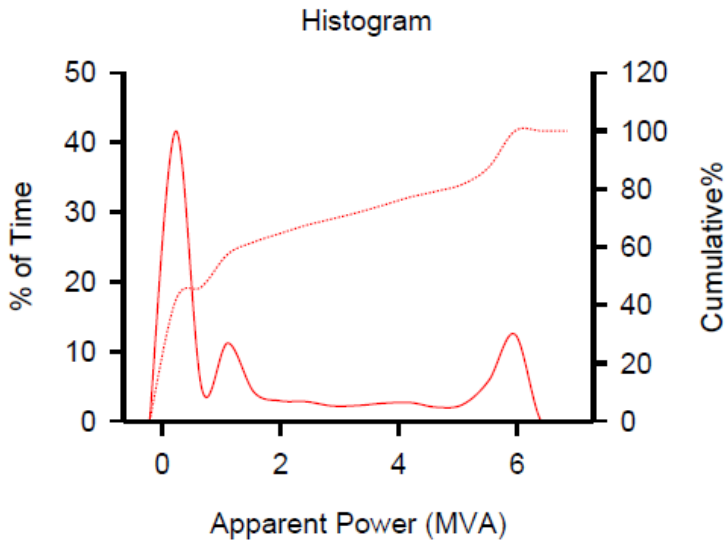


Next steps – how energy is used

Power vs time is good, but a histogram reveals more!

- Ideally, the load should either be on or off.
- Histogram reveals that there are actually 3 modes of operation.
- For 40% and 10%, respectively, of the time this load is in other state. Eliminating/reducing the unwanted states is an energy saving opportunity!





Next steps – ISO50001 certification

Benefits…

- Helps company to gain competitive advantage.
- Helps company to improve its reputation.
- Proof that the company is serious about fighting climate change.

ISO 50001

Energy Management System

END…