# ENERGY EFFICIENCY

## Cooling and Lubrication technology, improvements in reliability and system efficiency.

### PROJECT BACKGROUND

- A secondary grinding duty VERTIMILL® cooling and splash lubrication circuit at a copper/gold mine in NW Queensland, Australia, required upgrade improvements to extend the reliability and system efficiency through its processes in 2nd stage ore grinding.
- Inverted 850kW installed power 3 phase induction motor driving a shaft down, 2 stage Planetary, spur gear Gearbox. 400 litre oil volume capacity.
- Lubricant is Mineral oil ISOVG320.

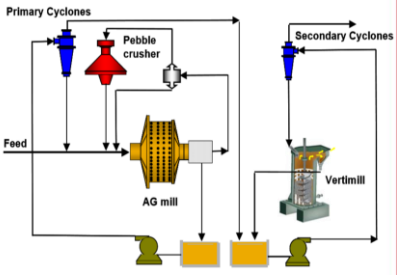
### INITIAL SITUATION

- End user approached ISADRAULICS to recommend a solution to improve the cooling and operational reliability of the VERTIMILL® splash lubrication circuit after the end user encountered a significant mechanical failure of the 2 stage planetary gear box.
- A cooling tower circuit was the medium to cool the lube system via two (x2) shell and tube heat exchangers. Cooling control was erratic.
- Inadequate filtration on the lube circuit compromised ISO cleanliness level targets hence requiring further auxiliary off line filter systems to be employed.

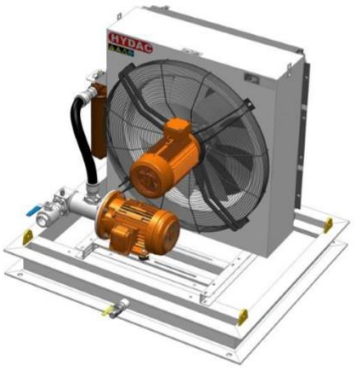
### PROJECT OBJECTIVES

- Mitigate risk of ingress contaminate cooling tower circuit water from the lubrication circuit.
- Remove inefficient shell & tube cooling technology circuit and replace with high efficiency air blast cooling system.
- Design an independent compact footprint cooler/lube system with environmental bunding, integrated dual change over filtration, high efficiency screw pump and motor set and correct oil sampling points. Enabled relocation of off line auxiliary filter system elsewhere.
- Remove old flexible hosing and fixed tube work and replace with new tube systems for safe work environment and improved housekeeping.

### INDUSTRIES


Two stage grinding flowsheet




### HYDAC SOLUTION

- Old Cooling/Lubrication system prior to upgrade …

- Upgraded Cooling/Lubrication system by ISADRAULICS/HYDAC Australia cooling division…


HYDAC

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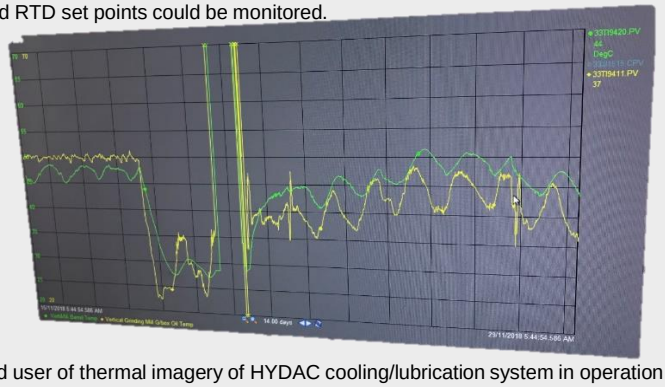
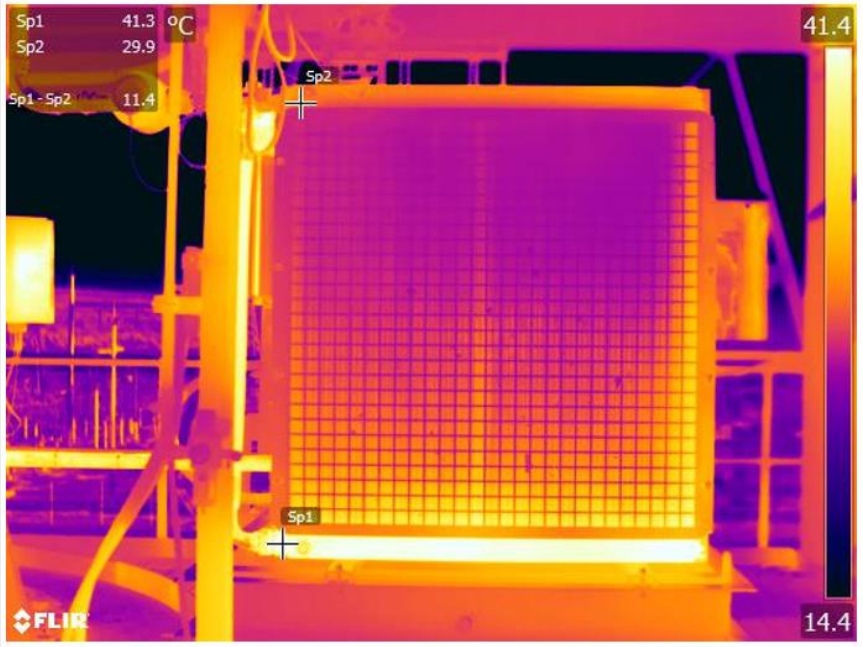
## RESULTS

- Flow rate achieved to meeting exacting OEM specifications to the 2 stage spur gear, planetary gear box.
- Theoretical calculations from using HYDAC Cool–IT! software provides real world outcomes of cooling system improvements when applied to the actual application.
- OEM specification of maximum oil operating temperature of 2 stage planetary gearbox is published at 95°C, however the original cooling/lubrication circuit would escalate past this point very quickly in high ambient temperatures.
- Client required target oil temperatures to 2 stage planetary gearbox to aim for 55°C at operation at worse case ambient temperatures and RTD set points could be monitored.



- Snap shot below taken by the end user of thermal imagery of HYDAC cooling/lubrication system in operation at approx.38°C ambient (29/11/2018),. Δt of approx.10°c inlet oil temp to outlet oil temp.




**Hydac sales information**

Project manager Steve BUTTERY

**Input data**

| | | |
|---|---|---|
| Medium | | Oil ISO VG320 |
| Liquid Flow | [l/min] | 75 |
| Excharger with pump | | NO |
| Pump with filter | | NO |
| Max liquid temp. | [°C] | 75.0 |
| Max Ambient temp. | [°C] | 50.0 |
| Power | [kW] | 43.0 |
| Altitude | [m] | 10.0 |
| Lower Tollerance | [%] | 0 |
| Circuit type | | OPEN |

**Performances Results**

| | | |
|---|---|---|
| Sap Code | | 3773334 |
| Cost index | | 40.0 |
| **Open Circuit** | | |
| Power | [kW] | 45.14 |
| Power diff. | [%] | 4.99 |
| Outlet liquid temp. | [°C] | 54.01 |
| Outlet air temp. | [°C] | 55.99 |
| Specific power | [kW/K] | 1.81 |
| Pressure drop | [bar] | 0.71 |
| Viscosity | [cst] | 87.96 |
| RPM (for simulation) | | 1500 |
| Air flow rate | [m3/h] | 23600 |
| **Noise level @max speed** | | |
| SPL @ 1m | [dB(A)] | 81 |
| RPM | | 1500 |
| Dimensions | [mm] | 1180.0 x 810.0 x 1050.0 |
| Weight | [kg] | 170.0 |

## KEY FIGURES

**DESIGNED AND DEVELOPED BY HYDAC Cooling Systems Australia.**

**LOCALLY DEVELOPED AND MANUFACTURED**

**ISADRAULICS OFFICIAL NW/QLD SERVICE PARTNER TO HYDAC.**

**LOCALLY SERVICED AND SUPPORTED.**

**LOCALLY SERVICED AND SUPPORTED. NATIONAL OE SUPPORT NETWORK.**

**LOCAL COMPETENCE, NATIONAL GROUP NETWORK.**

**BESPOKE HYDRAULIC SYSTEMS INSTALLED IN MOUNT ISA.**

**CASE STUDIES AVAILABLE.**

## CUSTOMER BENEFITS

- High accuracy of oil sampling at all times.
- Superior filtration technology for immediate ISO Cleanliness class targets and changeout facility on the run.
- Locally and Nationally supported systems and components.
- Improved system availability and reliability.
- High performance cooling at very high ambient temperatures.

## FURTHER APPLICATION AREAS

- Thickener Drives,
- Fluid Coupling Drives,
- Closed Loop Hydraulic Systems,
- Primary autogenous milling lubrication and Hydraulic systems,
- Turbine Lubrication systems,
- High end critical rotating hydraulic lubrication circuit equipment.