

**CONDITION  
MONITORING  
SYSTEM AND  
COMPONENT  
KEY POINTS**



**RAM**

Remote Asset Monitoring





# CUSTOMISE A RAM PACKAGE TO BEST SUIT YOUR BUSINESS REQUIREMENTS

This high-tech system seamlessly integrates with a wide range of existing communication protocols, including CAN bus, Modbus, Profibus, and Ethernet

Additional condition monitoring options can include:

- Component & oil temperatures
- Hydraulic & lubricant pressure/vacuum
- Oil flow measurement
- Fluid level
- Vibration monitoring
- Inclination/tilt measurement
- Engine data (J1939)
- Machine OEM CAN bus data
- PLC Logic
- Industrial Cameras

# Hydraulic System Monitoring

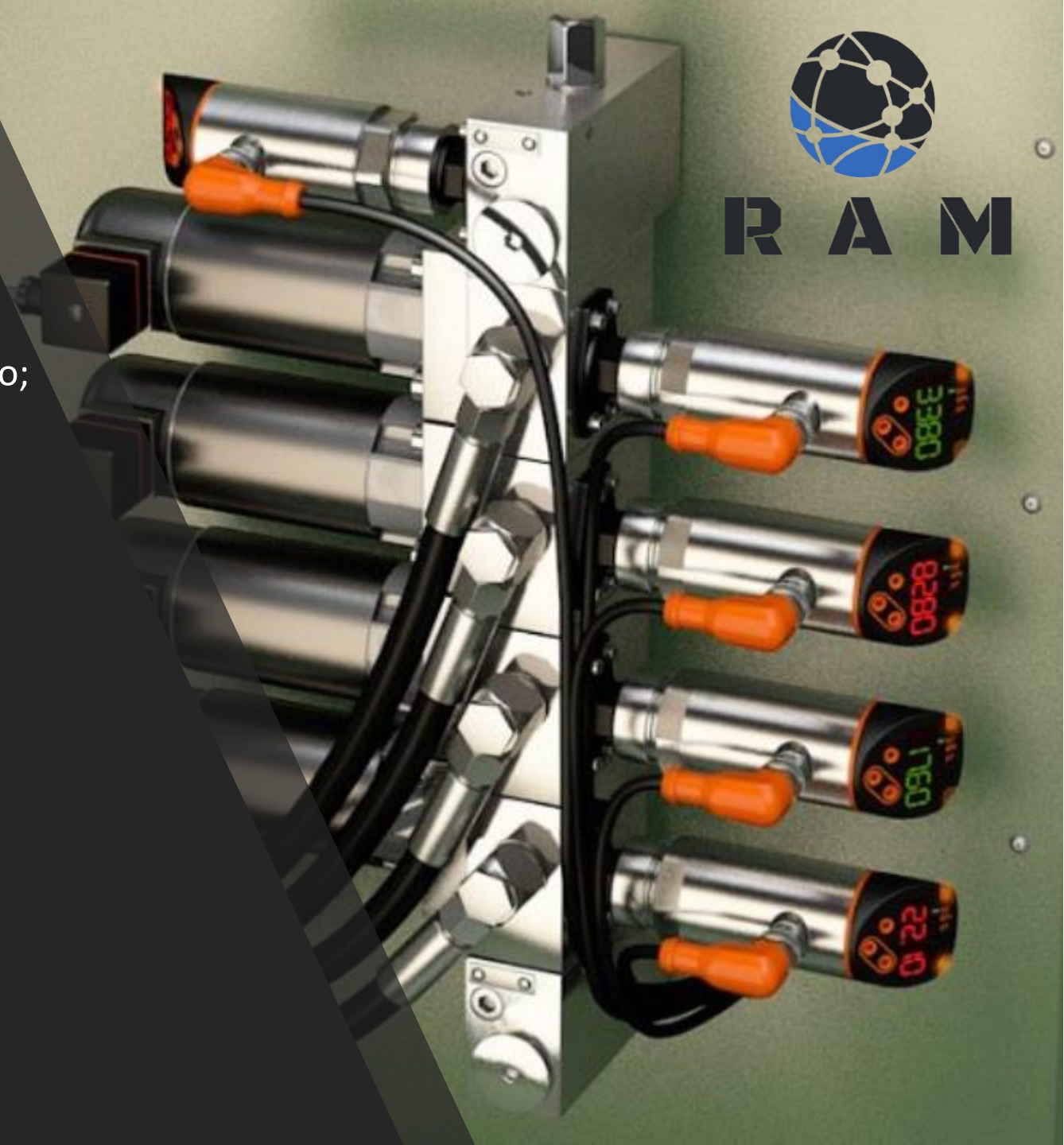
Multiple hydraulic measurements can be displayed and recorded. Data points may include, but are not limited to;

- Hydraulic pump delivery pressure
- Hydraulic pump instruction pressures
- Hydraulic pump suction vacuum/pressure\*\*
- Servo/Pilot pressure
- Control valve signal pressures
- Swing/Travel pressures
- Air pressure
- Tank pressure
- Air filter restriction

\*\* Used in conjunction with machine angle sensor, to identify incorrect practices walking on/off benches.

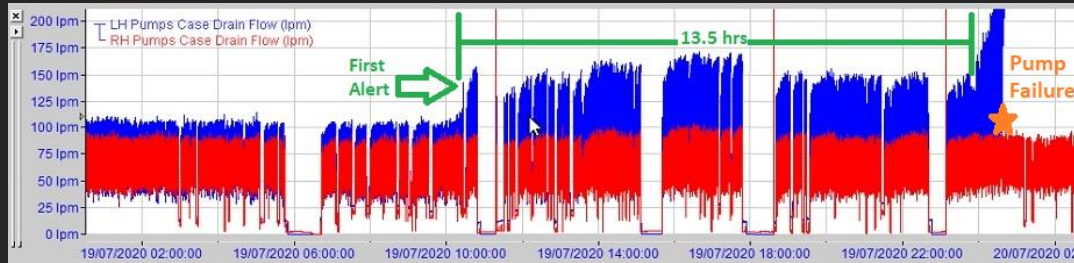


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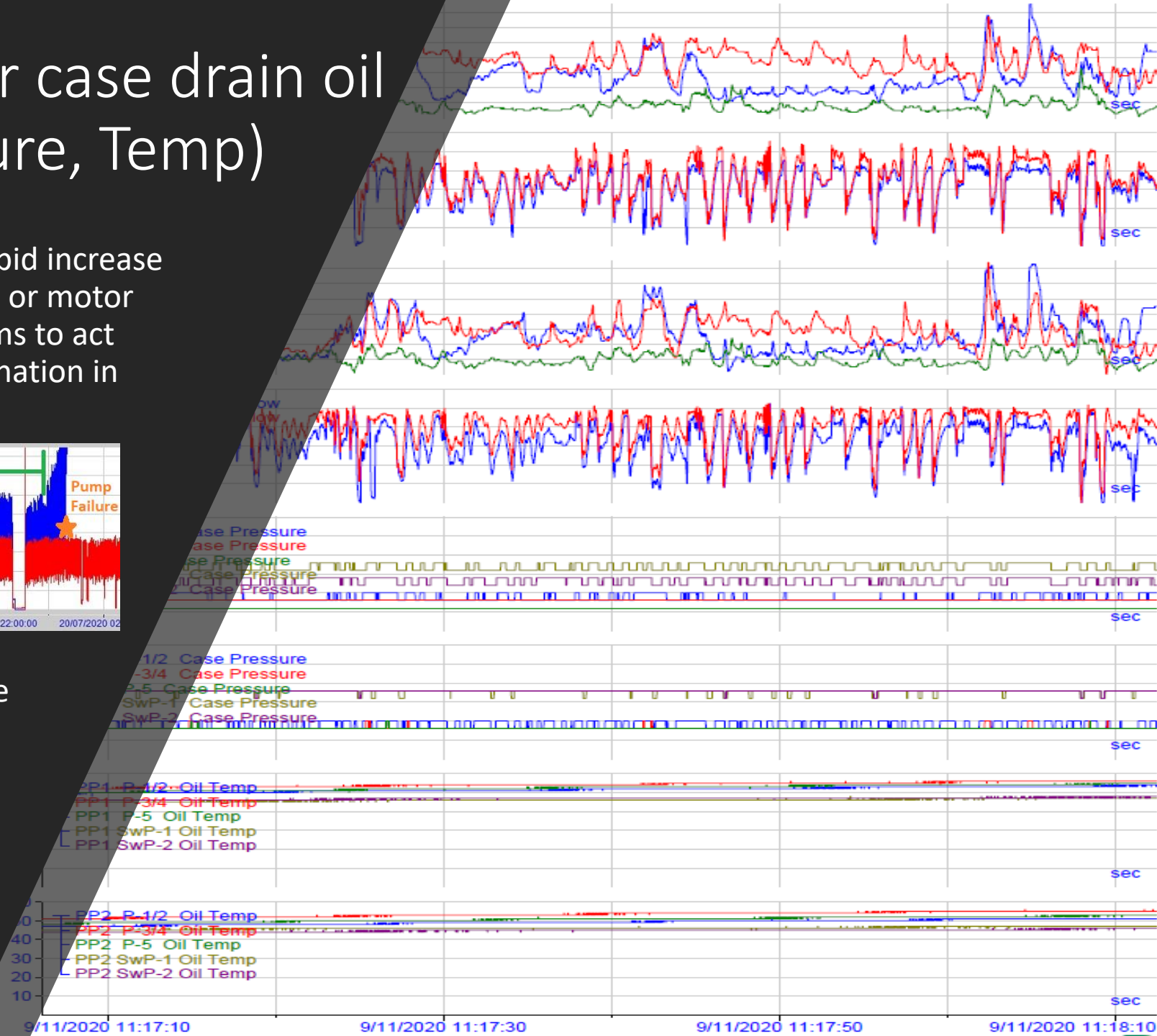


# Hydraulic Pump & Motor case drain oil monitoring (Flow, Pressure, Temp)

- Alerts can be generated in the event of rapid increase of case drain oil flow, likely due to a pump or motor failure. Allowing on site maintenance teams to act immediately and prevent further contamination in the hydraulic system.



- Case drain flow rate measurements can be trended over time to identify wear and potentially predict component failure.



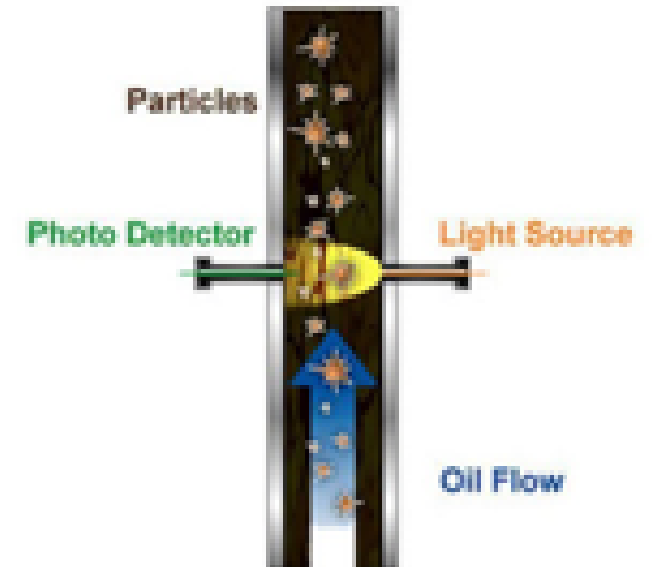
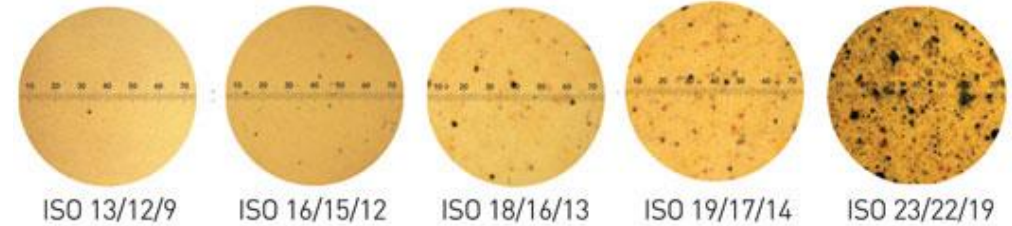
# Oil Contamination Monitoring

- Reliability teams can trend particle contamination data, to assess oil cleanliness, and effectiveness of filtering systems.
- Measurements of small particle contamination are according to ISO 99 (ISO 4406:1999) standards.
- Alerts can be sent via email or text, if an elevated contamination level is detected, to alert maintenance personnel to conduct further investigation i.e. contamination ingress.



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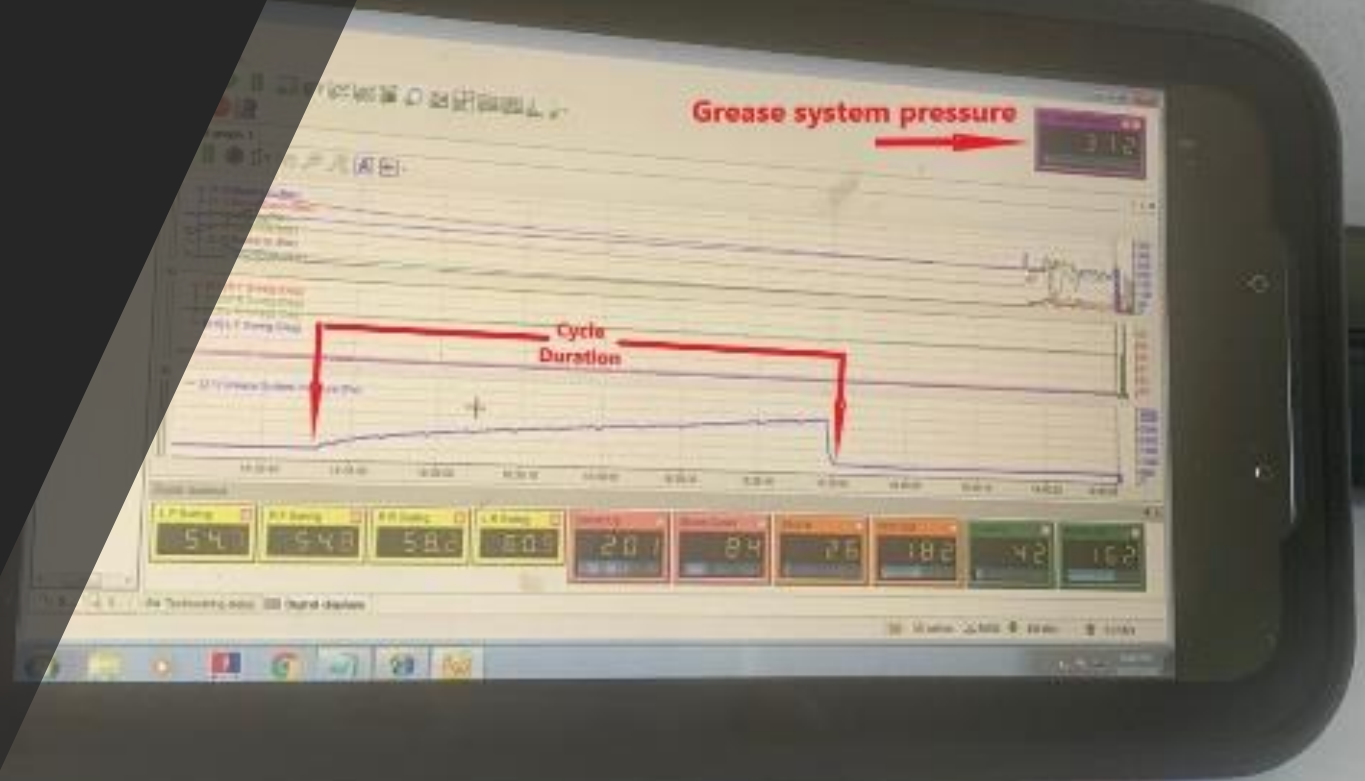
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# Hydraulic Pump & Pilot Pressure Monitoring

- Pressure sensors monitor hydraulic pump and pilot control pressures, to indicate the systems are operating within design specifications.
- A technician may view data via laptop, tablet or smart phone at the hydraulic valves, where adjustments are able to be performed.
- Sensors with built in digital/analog display option are also available.

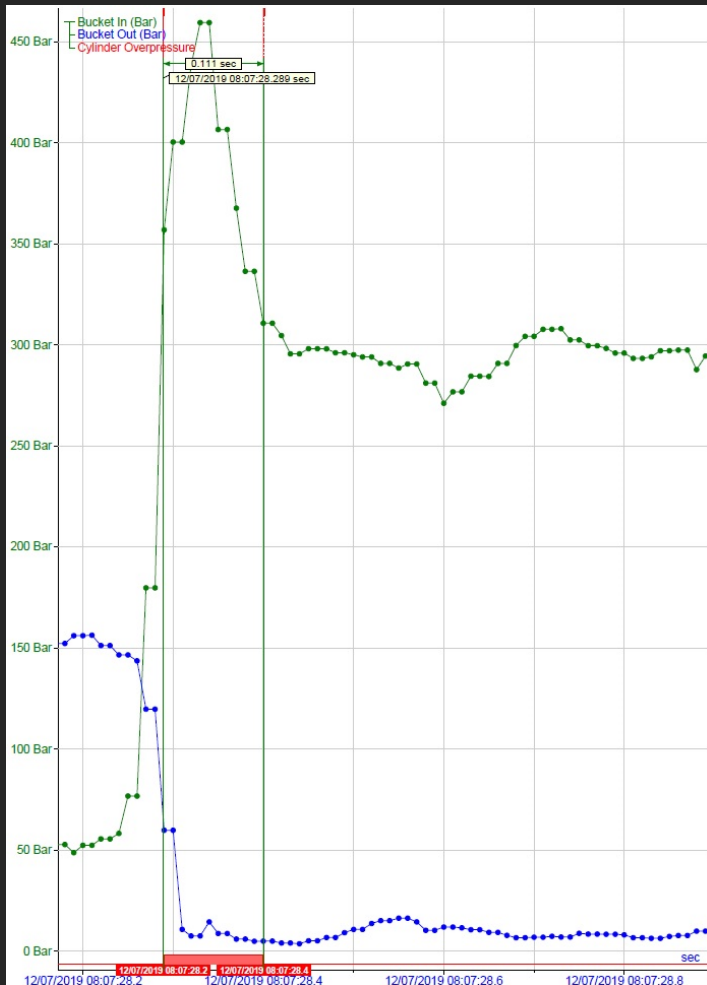


# Cylinder Pressure Monitoring



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- Reports may be generated indicate the occurrences of hydraulic pressure spikes and duration of hydraulic overpressure events.
- Email alerts can be sent to on site maintenance personnel if a cylinder overpressure has been detected.
- Findings can be used to identify potentially faulty or incorrectly adjusted hydraulic circuit relief valves, incorrect operational behaviors and/or 'hard dig' conditions.
- Reports are customizable and can be generated at the end of each hour, shift or day.

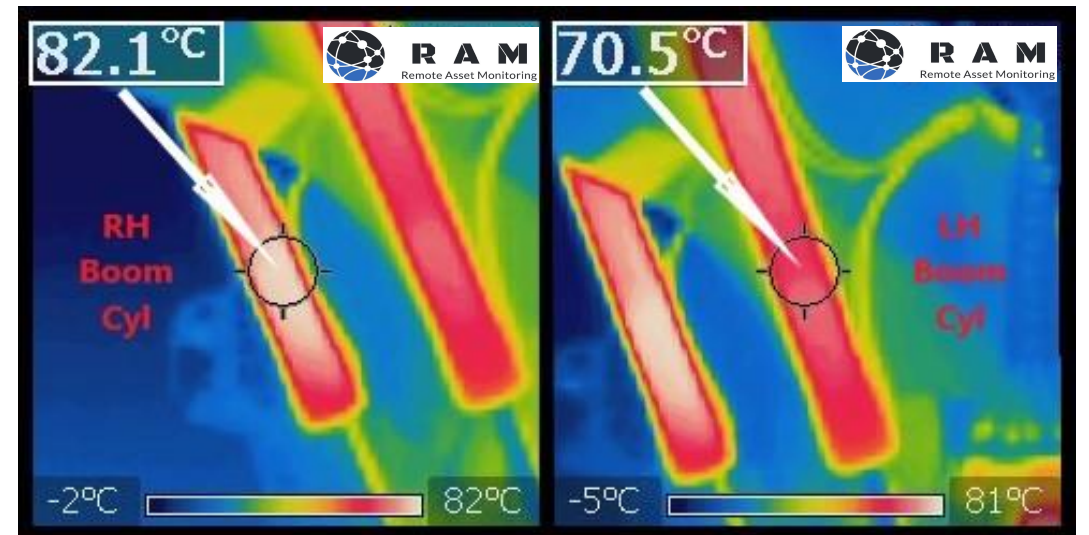
## Sample of Auto-Generated Pressure Spike Report

Time	Count	Max Press	Max Press Time Secs
2019/8/13, 12:26:01 AM	1	347.65	0.07
2019/8/13, 12:26:25 AM	2	342.56	0.09
2019/8/13, 12:28:57 AM	3	349.41	0.06
2019/8/13, 12:29:44 AM	4	343.44	0.05
2019/8/13, 12:31:29 AM	5	340.99	0.06
2019/8/13, 12:34:04 AM	6	341.01	0.10
2019/8/13, 12:34:07 AM	7	341.01	0.10
2019/8/13, 12:34:45 AM	8	356.87	0.32
2019/8/13, 12:34:48 AM	9	356.87	0.32



# Cylinder Temperature Monitoring

- Assists reliability teams in identifying potentially faulty hydraulic cylinders, preventing catastrophic failures and resultant damage to other components.
- Email alerts may be automatically sent to on site maintenance personnel once a temperature differential limit (between cylinder pairs) has been detected. Enabling immediate action.
- Reduction in major downtime, additional parts and labor.





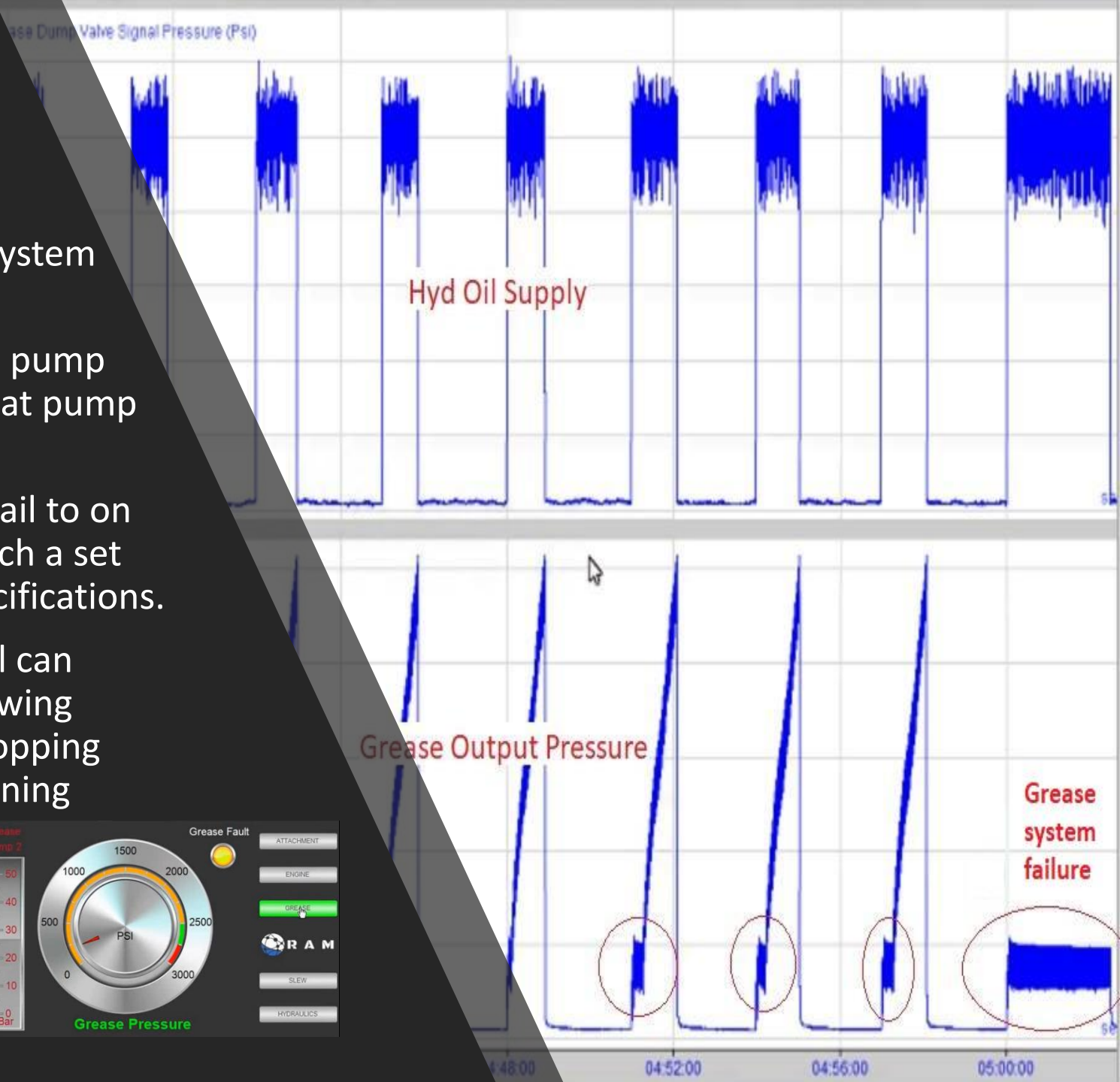
# Grease System Monitoring

- Monitoring all aspects within the lubrication system is crucial to machine reliability.
- Conditions that are monitored include, grease pump hydraulic oil supply pressure, grease pressure at pump outlet, and end of line grease pressure.
- Maintenance alerts are able to be sent via email to on site personnel, when a condition does not reach a set point within a specified time, as per OEM specifications.
- In the event of a fault, maintenance personnel can remotely view the alert data in real-time. Allowing analysis of the fault characteristics without stopping operations, decreasing downtime and maintaining productivity.



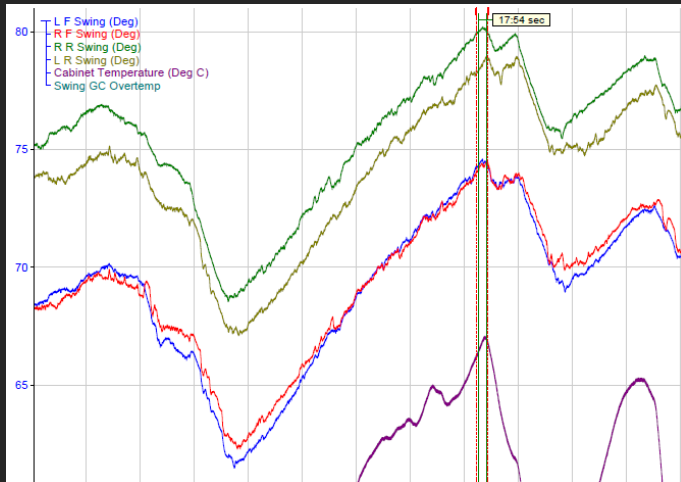
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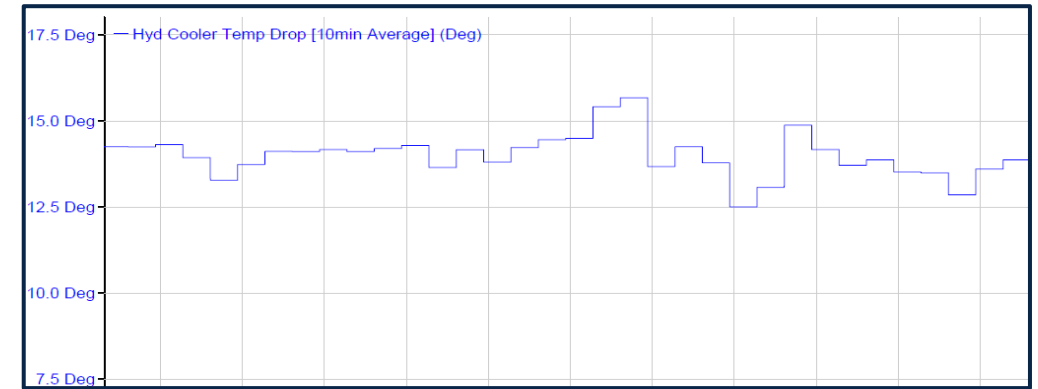
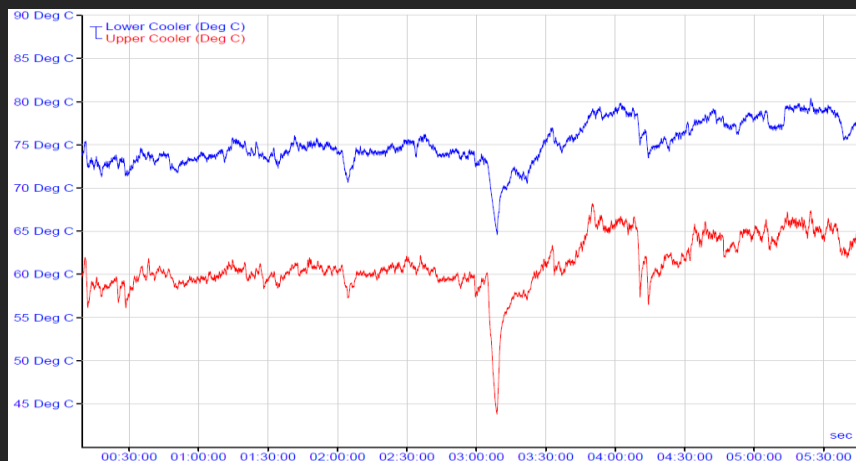
# Swing Gearcase Temperatures

- Swing gearcase temperature monitoring can identify early machine faults, preventing catastrophic failures, potentially saving thousands in breakdown costs.
- Alarms are generated when a gearcase temperature exceeds normal temperature or a high temperature differential occurs between boxes.



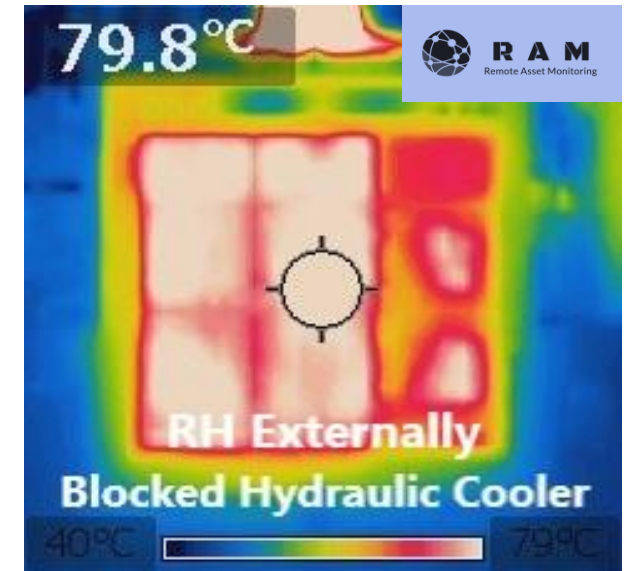
# Hydraulic Cooler Temperature Monitoring

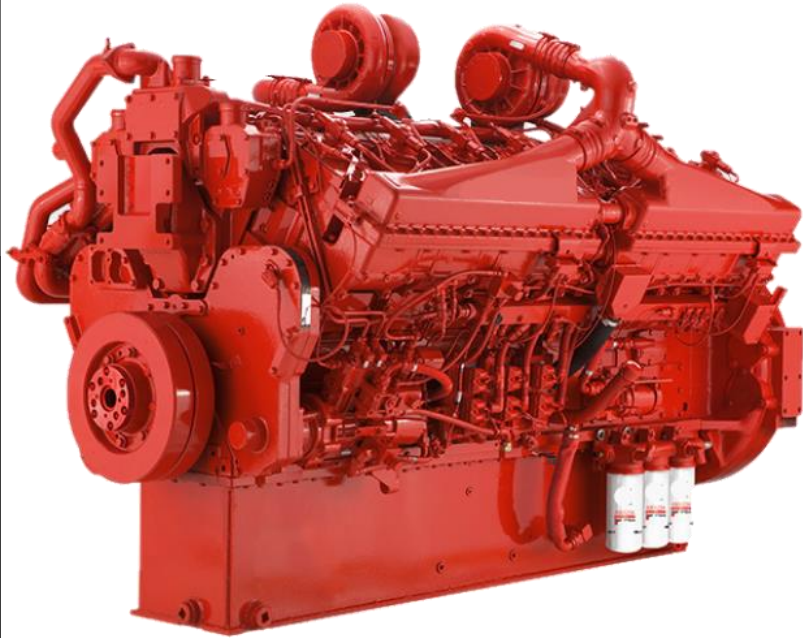
- Through data analysis, reliability teams have the potential to detect internally or externally blocked hydraulic coolers, and instances where coolers are not receiving adequate air flow.
- Being able to identify these faults before they cause downtime, will allow maintenance teams the lead time they require to scheduled appropriate repairs.



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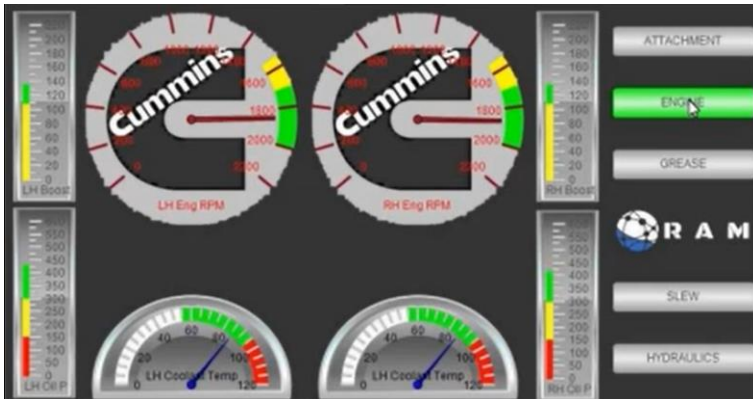




# Engine J1939 CAN-bus Data Monitoring



- Engine J1939 public CAN data, can be available in either live-view only, or live-view and data recordings, as required.
- Alarm points for data signals and diagnostic reports can be developed from the J1939 data.
- Assists with diagnostic fault finding, especially for dual engine machines, by allowing easy data comparison.



# Rugged Industrial Camera

- Proven, rugged IP cameras can be mounted at various locations throughout the machine.
- Footage is recorded and can be accessed remotely for viewing.
- Recorded files can be edited and snipped for remote file transfer.
- Number, type and quality of camera, as well as hard drive size is completely customizable based on individual client requirements.



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