

# Maintaining the Reliability of Hydraulic Systems

Maintec Learnshops

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Presented by

**Mike Retford**



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# Hydraulic Systems

- Hydraulic Systems can be reliable:
  - If you maintain them
  - If you are lucky



# What Causes Hydraulic Systems to Fail?

- 80% are caused by contamination related issues. (A common figure used by the industry)
- What about the other 20%?
  - High operating temperature
  - Component quality
  - Incorrect installation
  - Acceptable wear

# Two Main Causes of Failure

- If the components have been built into the system have been correctly specified and installed then the two main causes of failure are;
  - Contamination
  - High temperature of the oil



# Contamination

- The system creates its own contaminants through wear. External contaminants come from the air, maintenance tasks and potentially new oil.
- Contaminants promote increased wear and can cause component failures through silting and blockage.



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# Contamination

- Classified as solid particles, water or anything that is potentially not a constituent of the oil.
- The particles that you can't see can cause real problems;



Relative sizes of particles

# High Oil Temperature

- Operation of oil continuously above 70 °C can have detrimental effects on its chemical structure. Lubrication is diminished and components such as pumps can fail.
- Oil tends to oxidise if heated for long periods and this is a permanent break down of the oil. Lacquers can form, coating components.
- Nitrile seals tend to break up when heated continuously.



# High Oil Temperature

- High oil temperature is not only detrimental to the system, it is potentially dangerous to personnel if it leaks.



# How to Maintain System Reliability

- Ensure your system is properly protected;
  - Filters are in the correct positions, sized correctly and have the most suitable media for the application.
  - Protection devices such as relief valves, temperature and level switches are fitted.
  - Coolers are fitted if required.
- Implement a hydraulic system maintenance programme.

# Hydraulic System Maintenance

- Implement contamination monitoring programme. Sample your oil, set a cleanliness target and trend.

Sample No: 3731222      Job No.:      Sampled: 22/02/11      Received: 23/02/11  
 Machine Hrs: Not Given      Form No: W11347547      Oil Hours: Not Given      Brand: EXXON HI JET 4

**Diagnosis**  
 Wear appears satisfactory. No significant contamination. Advice: Monitor at the recommended sampling period.



An No.	Sample Date	Oil Condition													Additive Elements ppm				
		Visc. 40°C	Appearance	Dispersancy	Water	Glycol	Fuel	Initial pH	TAN	Oxidation	TBN	Ferrous Debris	ISO	Ba	Ca	Mg	P	Zn	
3	22/02/11	9	n/a	n/a	N	N	n/a	n/a	n/a	n/a	n/a	n/a	16/14/13	< 1	110	< 1	25969	1	
2	12/11/10	n/a	20	n/a	0.72	N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	< 1	125	< 1	29735	6	
1	19/08/10	12	20	n/a	N	N	n/a	n/a	n/a	n/a	n/a	n/a	20/17/15	1	128	1	25258	32	

An No.	Sample Date	Elemental Analysis - Contamination & Wear Metals ppm																Oil Chg	Oil Age	
		B	Na	Si	Li	Al	Cr	Cu	Fe	Pb	Sn	Mo	Ni	Ti	Ag	Mn	V			
3	22/02/11	< 1	4	5	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			-1
2	12/11/10	1	9	6	2	1	< 1	< 1	1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1			-1.0
1	19/08/10	5	6	3	2	2	< 1	< 1	1	2	3	< 1	< 1	< 1	1	< 1				-1.0



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# Inspect your Systems

- Inspect regularly
  - Look for leaks – replace seals & tighten loose fittings
  - Inspect condition of hoses – covers and swaging
  - Check working pressures – relief valve settings
  - Check filter blockage indicators
  - Check pump flows – case drain analysis



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# Maintain your System

- Change filters



- Clean or change suction filters or otherwise known as 'pump killers'



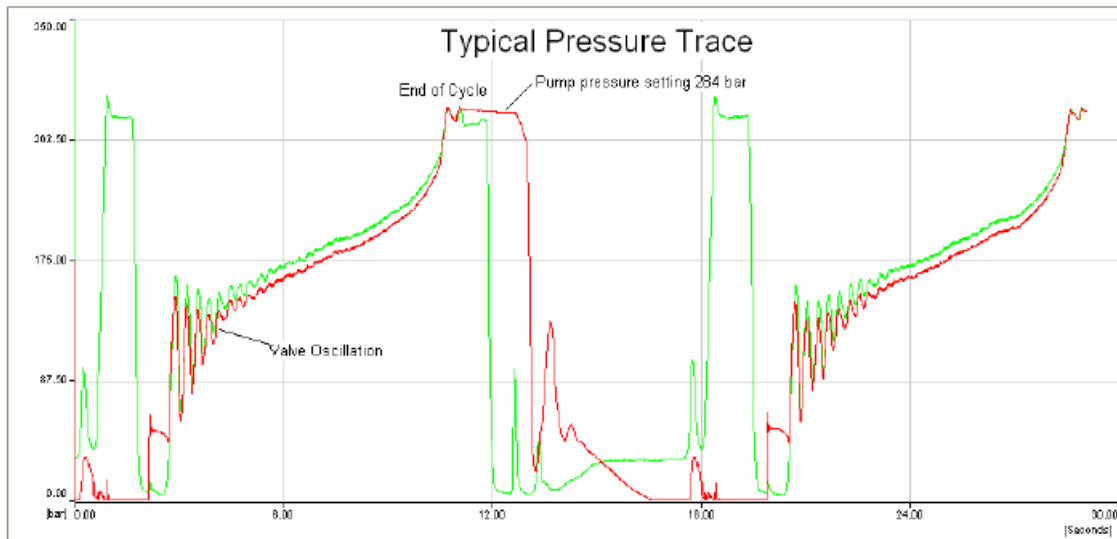
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# Maintain your System

- Change the breather
- Check the operation of temperature and level switches
- Clean air blast coolers and clean the water strainers on water/oil heat exchangers

# Monitor your System

- Finger print the system with pressure transducers, which will give you cycle times and pressures.
- Take a thermal image of the system.



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# Maintaining Reliability

A small amount of maintenance can significantly improve the reliability of your hydraulic systems.



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