

Effective Contamination Control

How Contamination Control Affects Machine Reliability

- Building reliability through contamination control
- The most destructive contaminants
- How contaminants attack base oil, additives, machine surfaces and impair lubrication
- Proactive maintenance and contamination control
- Proactive maintenance in three steps
- Contamination control and the oil drain interval
- Financial benefits of a top drawer contamination control program

How Lubricants are Formulated to Resist or Control Contaminants

- Base oils and contaminants
- Additives that control contaminants
- Oil oxidation and the role of contamination
- Contamination-based lubricant selection strategies

Heat Contamination

- When is heat a contaminant?
- The Arrhenius Rate Rule and the drain interval
- Mitigating heat effects with lubricant selection
- Thermal stability of oils and grease
- When is hot oil good
- Setting operating temperature limits
- Causes of heat contamination
- Controlling heat contamination in grease
- When to use coolers to control heat
- Heat monitoring strategies and thermography

Particle Contamination

- Wear caused by particle contamination
- Silt lock failure modes
- Machinery contaminant sensitivity by type
- How particles influence oil oxidation
- Describing and quantifying particle contamination
- Particle ingress categories
- How to use the ISO Solid Contaminant Code
- How to set target cleanliness levels for lubricants
- Particles counters
- Patch testing and microscopic analysis of particles
- Particle contamination in grease

Controlling Soft Contaminants

- What are soft contaminants?
- Where do they come from?

- The harm caused by soft contaminants
- Strategies for the analysis of soft contaminants
- Strategies for removing soft contaminants

Moisture Contamination

- Water in oil, states of coexistence
- Harm caused by water contamination on the oil
- Demulsibility characteristics of lubricants
- How water makes other contaminants
- Sensitivity of machines to water contamination by type
- Water and corrosion
- How to set target dryness levels for lubricants
- Technologies and methods for detecting and quantifying moisture levels
- Moisture effects on grease

Air and Gas Contamination

- Air in oil, states of co-existence
- Sources of air contamination
- Troubleshooting air ingress problems
- Air release, foam tendency, and foam stability
- Harm cause by air to the oil and lubrication properties
- How air influences heat and bulk modulus
- Air effects on adiabatic compressive heating and cavitation
- Air and tank design issues

Glycol Contamination

- The destructive potential of glycol (antifreeze) contamination
- Sources of coolant leaks
- Reaction products of glycol/oil mixtures
- Strategies for detecting glycol in oil

Fuel and Soot Contamination

- Sources of fuel and soot contamination in engine oil
- Harm fuel and soot causes engines and lubrication performance
- Methods to detect and monitor fuel and soot
- Soot load versus soot dispersancy
- Soot and EGR engines
- The role of bypass filters and separators in controlling soot

Microbial Contamination

- Types of biological contaminants in lubricants
- Lubricants and applications of highest risk for microbial contaminants
- Harm caused by biological contaminants

- Detecting and controlling microbial contaminants

The Lubricant as a Contaminant

- Incompatible grease and harm caused
- Acidic byproducts of degraded and contaminated lubricants
- Cross contamination, or mixing, of incompatible lubricants
- How to detect a mixed lubricant
- Ways to mitigate the risk of lubricant mixing

Controlling Contaminant Ingression

- Cleanliness of new lubricants
- Controlling contamination during lubricant storage
- Controlling contamination during lubricant handling
- How to inspect machines for contaminant ingress sources
- Breathers and headspace management
- Roll-off machinery cleanliness (new and rebuilt)
- Controlling ingress during machinery inspection and repair
- Parts storage and handling influences on ingress
- How machine design influences contaminant ingress
- Selecting seals for controlling contaminant ingress
- Sources of water contamination
- Using grease to exclude contamination
- Contamination control in laid-up and stand-by equipment

How Lubricant Application Methods Cause or Control Contamination

- Which application methods most effectively control contaminant ingress
- Using a grease gun to reduce contaminant ingress
- Application methods to avoid
- Benefits of oil mist lubrication in controlling ingress
- How to introduce make-up oil to reduce ingress

Contaminant Removal

- Filter type and location options
- Filter construction and media options
- Off-line filtration and its unique benefits
- By-pass filters use in diesel and gasoline engines
- When to retrofit filters on bath and splash lubricated machines
- Strategies for filtering high viscosity oils
- Filter performance tests and the Beta Ratio

- How to select a filter for a specific target cleanliness
- Strategies for optimizing the filter change interval
- Strategies for using filter carts
- Settling tanks and reservoir design considerations
- Oil reclamation and Reconditioning Strategies
- Degassing systems
- Magnetic separation of particles
- Air stripping and vacuum dehydration
- Coalescence and water removing filtration
- Electrostatic and charged particle separators
- Centrifugal separators
- Acid scavenging technologies including ionexchange resins

Flushing Strategies

- What conditions require flushing
- How avoid the need for a flush
- Selecting the correcting flushing strategy
- Defining the use of flushing fluids and equipment
- Common flushing problems

Contamination Control Case Studies

- Gearbox and rolling element bearing applications
- Papermills
- Power plants
- Steel mills
- Petrochemical plants
- General manufacturing