Precision Filtration Products

WIND TURBINE FLUID SERVICES

THE PROBLEMS:

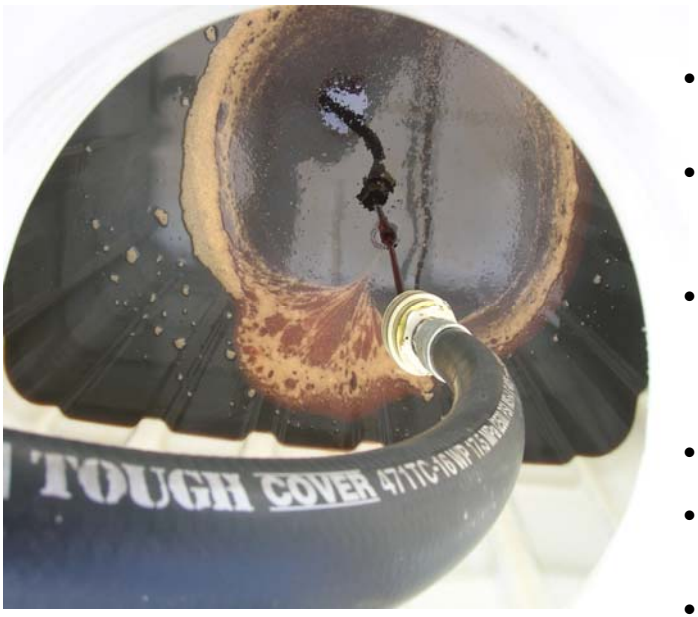
- **System Faults and Mechanical Failures**
- **Unplanned Turbine Downtime**
- **Shortened Fluid Service Life**
- **Shortened Component Service Life**
- **Increased Maintenance and Repair Costs**
- **Lost Revenue**

THE SYMPTOMS:

- **Accelerated Mechanical Wear**
- **Corrosion of Metal Surfaces**
- **Loss of Lubricity**
- **Additive Breakdown**
- **Viscosity Variance**
- **Bearing Failure**

THE CAUSE:

- ***CONTAMINATION***



- ***Fluid contamination of oil is the number one cause of component failures.***
- ***70%-75% of failures are related to surface degradation caused by mechanical wear.***
- ***Free and dissolved water and particulate matter in hydraulic and lubrication systems are the leading cause of mechanical wear.***
- ***Contamination leads to accelerated abrasive wear, corrosion of metal surfaces, increased electrical conductivity, viscosity variance, loss of lubricity, fluid additive breakdown, bearing failure and more.***
- ***Unfiltered new oil is one of the major sources of contaminant.***
- ***It is vital that new oil is filtered to the required ISO Cleanliness Codes before it is introduced to the component.***
- ***Maintaining clean, dry oil will extend component and equipment life by up to 5 times the normal service life.***

THE SOLUTION:

Precision Filtration Products' Wind Turbine Fluid Services department offers our Gearbox and Hydraulic Oil Change-Out Program to help protect your fluid systems against failure due to poor oil quality. Our Gearbox and Hydraulic Oil Change-Out Program allows us to meet or exceed required oil cleanliness codes per ISO 4406:99

Precision Filtration Products • P.O. Box 218 Pennsburg, PA 18073
Phone: 215-679-6645 Fax: 215-679-6648 E-mail: sales@precisionfiltration.com web site: www.precisionfiltration.com

GEARBOX and HYDRAULIC OIL CHANGE-OUT PROGRAM

Precision Filtration Products wind turbine services provide for:

- Improved Equipment Reliability
- Improved Power Generation Production Time
- Reduced Micropitting
- Reduced Maintenance Costs

PFP on-site service is available for basic “drain and fill” to our most comprehensive high speed filtered flushing service for gearbox and hydraulic systems.

Standard Services:

- Draining of existing oil from the entire system
- Replacement of existing breathers and oil filters with Beta$_{[c]}$ 1000 elements per ISO 16889 standards
- High velocity flushing and filtering of the oil system
- Replacement of operating oil with new oil filtered to OEM or the turbine owner’s specifications
- On-site laser particle counter analysis
- On-line laser particulate analysis
- Thorough inspection of the entire oil system
- On-site filtration systems for make up oil
- On-Site Flushing & Filtering of Gearbox and Hydraulic Systems
- Temporary and Kidneyloop filtration to maintain critical ISO Cleanliness

Current ISO Code	Target ISO Code 2 x Life	Target ISO Code 3 x Life	Target ISO Code 4 x Life	Target ISO Code 5 x Life
28/26/23	25/22/19	22/20/17	20/18/15	19/17/14
27/25/22	23/21/18	21/19/16	19/17/14	18/16/13
26/24/21	22/20/17	20/18/15	19/17/14	17/15/12
25/23/20	21/19/16	19/17/14	17/15/12	16/14/11
25/22/19	20/18/15	18/16/13	16/14/11	15/13/10
23/21/18	19/17/14	17/15/12	15/13/10	14/12/9
22/20/17	18/16/13	16/14/11	15/13/10	13/11/8
21/19/16	17/15/12	15/13/10	13/11/8	-
20/18/15	16/14/11	14/12/9	-	-
19/17/14	15/13/10	13/11/8	-	-
18/16/13	14/12/9	-	-	-
17/15/12	13/11/8	-	-	-

All Precision Filtration Products personnel have completed the “PFP Wind Turbine Safety Training” and are required to attend safety refresher training every 12 months and be capable of performing all aspects of service both on ground and up-tower. Our trained staff believes in and adheres to strict environmental compliance during all aspects of the site service.

Water Removal - filters that remove water while maintaining ßx$_{[c]}$ = 1000 efficiency down to 1µ/2.5µ$_{[c]}$

Oil Testing - use On-line Particle Counters to determine current ISO levels

Mobile Filter Carts & Housings - Filter new fluids during transfer and flush fluids is service; remove particulate and water contamination to improve ISO Ratings and Reduce Particle Counts

Filter Elements - offer better fluid cleanliness and higher dirt holding capacities

Breathers - assure air ingested is dry and clean

Precision Filtration Products • P.O. Box 218 Pennsburg, PA 18073
Phone: 215-679-6645 Fax: 215-679-6648 E-mail: sales@precisionfiltration.com web site: www.precisionfiltration.com