Advanced Predictive Diagnostic Tool for Engines and critical rotating equipment

Neptunus Power Plant Services Pvt Ltd
The Context

Today’s industry

- Faces high pressure to reduce operational costs, and yet have high reliability.
- Wants to run more efficiently, waste less and be more considerate towards the environment.
- New technologies are expensive and complicated to adopt and require highly skilled people to operate.
- Maintenance 4.0 is still a hazy term. Few know how to move forward.
- However, there is a better way to do maintenance.
- Neptunus has the right solutions for you, and still brings value to you.
The Problem with today’s method

- Measurement of linear vibration is outdated.
- Asset owners are extending overhaul cycles.
- Costs of downtime and breakdowns are rising even as expenditure on maintenance has increased.
- Maintenance is reactive and/or time-based rather than predictive and/or condition-based.
- By the time abnormalities show up here, irreversible damage has already occurred.
- MTBO may be extended, but overhauls are still needed.
- Breakdowns still occur. System is not foolproof.
Advanced Predictive Maintenance

Optimized

Optimum Performance

Emerging fault condition

Early Stage Detection
Of the fault in development phase

Later Stage Detection of the fault in deterioration phase

Apparent evidence of fault (audio-visual-sensory signs)

Equipment breakdown

Time available for maintenance planning & corrective action

A stitch in time saves nine...
Torsional vibration analysis enables detection of an emerging fault MUCH EARLIER compared to conventional linear vibration analysis. So you get MORE TIME to plan & take preventive/corrective action.

With conventional PDM practices

With advance technology

PDM under Maintenance 4.0

Equipment Condition

Failure

4
Our Vision

Engine/Machine Health vs. Time

- NEPTUNUS EXTENDED CYCLE
- OEM RECOMMENDED CYCLE
- SELF-EXTENDED CYCLE

OVERHAUL
How?

- Use of highly advanced technology, which is easy to use and puts the power in the hands of the operators.

- Solution has one main pillar:
  - **Torsional Vibration**: the most sensitive and advanced form of vibration measurement
  - Early Warning Diagnostics of machine health
  - Pre-empt failures, so you can plan maintenance cycles better
  - Change only what is faulty, and do it before time, to save on money and downtime!
Torsional Vibration: alphaSystem

- Most advanced Predictive Diagnostic Tool for Rotating equipment
- Uses Torsional Vibration, far more sensitive than traditional linear vibration.
- Detect Cancer at Stage ZERO!
- Non-invasive, user-friendly methods
- IOT-Ready: Monitor equipment health remotely on your mobile devices
- Enables on-site, over the network or remote cloud based connectivity for real time monitoring of machine health anytime and from anywhere
The Alpha System

**Principle** - Measurement of Torsional Vibration and analysis of its variation through statistical and mathematical computation to derive component specific and overall engine health indicators.

- MPU measures the Torsional vibration
- TDC Sensor references the cylinders
Alpha System: Theory

Stochastic computation of statistical moments:
- Mean
- Variance
- Skewness
- Kurtosis

- **Angular Displacement** = phase difference between Hilbert transform & carrier signal
- **Angular Velocity** = magnitude of Hilbert transform
- **Angular Acceleration** = derivative of velocity
Alpha System Applications

Motors
Applications: Electric Motors

- Compares theoretical signal of rotation of shaft to measured signal
- Puts the signal difference through statistical and mathematical computation
- Algorithm helps derive component specific and overall motor health indicators.
- MPU measures the Torsional vibration on the motor shaft
- Gives you a detailed report without the need for vibration level 1 or 2 analyzers.

- This is remarkable technology.
Motor/Alternator Indicators

OVERALL INDICATORS

- Bearing/Damage
- Stability
- Electromagnetic Stress
Motor/Alternator Indicators

- This indicator measures unexpected stress pulses in movement of rotating system.
- Potential problems could be shocks stemming from stress on rotating shaft during operation:
  a. Inadequate lubrication
  b. Misaligned shaft
  c. Insufficient bearing load
Motor/Alternator Indicators

- This indicator measures the stability of the speed by measuring shaft speed change in percentage.
- Potential problems could be unbalances of shaft movement due to:
  a. Broken rotor bar
  b. Mass unbalance
  c. Air gap eccentricity
  d. Rotor winding failure, stator winding failure
Motor/Alternator Indicators

- This indicator measures presence of unbalance supply voltage or current, single phasing, under or over voltage, reverse phase, overload, etc.
- Faults under this classification are:
  a. Under or over voltage of current or unbalance supply voltage or current
  b. Single phasing or reverse phase
  c. Overload or earth fault
Alpha System Applications

Torque
Applications: Torque

Torque is calculated by measuring the phase shift between Sensor A & Sensor B.
Applications: Torque

- alphatorque is used to determine static and dynamic torque on shafts of all diameters and speed ranges.

- No electronic parts have to be installed on the shaft. The system is easy to install, both on new installations and shafts that are in operation.
Torque: Indicators

- Static Torque
- Dynamic Torque
- Torsion
- Power
- Shaft Health
Torque: Indicators

Power
This indicator displays power transfer done by the shaft

Shaft Health
The shaft health is impacted by a variety of parameters like bearings, gearboxes, the propulsion system etc.
Alpha System Applications

Bearings
This indicator measures unexpected stress pulses in movement of rotating system.

Potential problems could be shocks stemming from stress on rotating shaft during operation:

- Inadequate lubrication
- Misaligned shaft
- Insufficient bearing load
Trend Monitoring Capability

Mechanical Health (in %)

40% Equipment Load
60% Equipment Load
70% Equipment Load

Equipment Running Hours
Remote monitoring of plant assets

Advanced Predictive Maintenance solutions with cloud connectivity for monitoring critical equipment health on real time basis from any remote location.
Remote monitoring architecture
Direct Benefits of the Alpha System

- Considerable savings in fuel consumption & overall efficiency
- Pinpoint faults during troubleshooting to trigger regular course corrections through trend monitoring
- Extend Overhaul intervals safely
- Eliminate catastrophic machine breakdowns
- Reduce Operational and Downtime costs
- Eliminate Breakdowns and the concept of overhauls completely
- Indicate overall health of the equipment
- ROI in less than six months
The Neptunus Way

We deliver the solutions that work & saves $

➔ O&M experience brings practical user’s perspective
  ➔ Opex vs Capex balance
➔ Solutions with life-cycle considerations for Long term benefits
  ➔ Customer-centric & responsive service
To know more, please contact

Neptunus Power Plant Services Pvt Ltd

Email : info@neptunus-power.com
Call : +91 9594410707