



ORBITAL. BRINGING OIL INTELLIGENCE TO LIFE.
Discover the story your oil analysis results have to tell.

 ORBITAL

Orbital combines the concept of the Journey of the Lubricant, oil sampling data, peripheral equipment, and environmental information to provide you with the most comprehensive oil analysis program. Orbital allows you to compare, combine, analyze, and report on all data points surrounding the health of your equipment and lubricant. Welcome to the new era of oil analysis...**Oil Intelligence.**

Formula for Oil Intelligence

Journey of the Lubricant is a Key Piece of Oil Intelligence

Oil analysis is used as an early detection of problems in equipment; however, issues tend to start well before the lubricant ever reaches the intended application. Trico's philosophy focuses on the practices that are directly impacting the equipment – from the time the lubricant arrives to the time its life is spent in the equipment. We call this Journey of the Lubricant® and believe this the best methodology when evaluating a reliability program and its practices.

The Journey of the Lubricant is broken down into 5 stages - Arrival, Storage, Transfer, Application, and Lifecycle. Adding oil analysis at these different stages, which we refer to as dimensional sampling, provides deeper, more valuable insight into the viability of your equipment lubricants and your practices.

Using these multiple data points and continuously cross-referencing and interpreting the relationships among them you can uncover answers that make a real impact on your lubricants, your equipment, and your whole operation. We call this more complete application of knowledge - **Oil Intelligence**. Utilizing this approach, you can look at each Journey of the Lubricant stage individually and implement incremental changes that can make a significant impact. So, stop doing oil analysis. **Start doing Oil Intelligence.**



ARRIVAL

Provides indication of the condition and care your supplier has taken to ensure lubricant meets specifications and is contaminant free.



STORAGE

Storage practices begin to identify how your practices are impacting your lubricant condition.



TRANSFER

Provides the best baseline for your equipment test results. Any changes from storage to transfer are affected by personnel interactions.



APPLICATION

Improper equipment configuration can allow contaminants into your system or cause the production of wear particles. Oil analysis offers the earliest warnings of wear and helps detect detrimental contamination.



LIFECYCLE

The most effective maintenance programs incorporate on-going, routine oil analysis, and data trending for continuous improvements and monitoring of lubricant and equipment condition.

The Value of Oil Intelligence

FEATURES

- ✓ Dedicated lubricant advisor provides step-by-step support for results interpretation, program customization, and equipment solutions
- ✓ Detailed platform and reports with relatable data, visual tools, and recommendations by experienced analysts
- ✓ Experienced laboratory and analytical staff - ensuring high quality and timely information
- ✓ State-of-the-art laboratory instrumentation utilizing applicable ASTM and ISO standards for producing reliable test data
- ✓ High-quality supplies and hardware available for consistent, repeatable sample collection
- ✓ Service and parts support to assist in lubrication program implementation

BENEFITS:

- ✓ Downtime can be organized and planned rather than reactive
- ✓ Troubleshoot problems with more precision, less guesswork
- ✓ Minimize component wear and extend equipment life
- ✓ Ensure lubricant condition for continued use
- ✓ Monitor viscosity levels for optimum performance
- ✓ Increase equipment reliability
- ✓ Extend oil change intervals

OIL INTELLIGENCE INDICATES:

- ✓ Chemical contamination of the lubricant
- ✓ Usable life of the oil
- ✓ Normal and abnormal machine wear
- ✓ Dissolved elements and concentration of additives
- ✓ Trends that contribute to harmful performance
- ✓ Optimum oil change intervals



Industrial Oil Analysis



Harsh operating conditions, extreme loads, and the high costs of replacement parts make oil analysis necessary in increasing the longevity of equipment. Routine oil analysis identifies problems before they become failures and allows you to take the necessary corrective actions.

Our industrial oil analysis combines the Journey of the Lubricant, dimensional oil sampling, and a variety of physical and chemical tests to assess lubricant condition and its ability to perform, as required by the equipment's application. We provide a variety of test packages to determine contamination levels and the health of your lubricant so you can take the necessary actions when needed.

Description	ASTM Standard
Acid Number	ASTM D664
Concentration of Small (<5 um) Wear Particles	
Concentration of Large (>5 um) Wear Particles	
Wear Particle Concentration (WPC)	
Wear Metal Concentration	ASTM D5185
Concentration of Contaminants	ASTM D5185
Additive Concentrations	ASTM D5185
Oxidation Testing	ASTM E2412
Anti-Wear Evaluation	ASTM E2412
Nitration, Sulfation, and other Chemical Characteristics	ASTM E2412
Particle Count for Fluid Cleanliness (ISO 4406)	ASTM D7596
Percent Water Concentration	ASTM D6304
Water Confirmation by Crackle Test	
Water Concentration in PPM	ASTM D6304
Viscosity at 40°C cSt	ASTM D445
Visual Inspection	
Wear Particle Metallurgy for Samples with Potential Wear Conditions	ASTM D7690
Wear Particle Types for Samples with Potential Wear Conditions	ASTM D7690

Advanced Annual Turbine and Large Reservoir Testing

Operating equipment such as turbine units, large hydraulic units, and large compressors are critical to operations and have major costs associated with maintenance activities or downtime. Advanced annual testing provides an additional layer of insurance, recommended by organizations like EPRI and ASTM. The added testing is aligned with common issues that these large reservoir units often encounter and is designed to provide remaining useful lifetime frames to allow planned maintenance, instead of reactive downtime.

Description	ASTM Standard
Acid Number	ASTM D664
Color	ASTM D1500
Demulsibility/Water Separability	ASTM 1401
Wear Particle Concentration	
Foam Sequence 3	ASTM D82
Oxidation/Nitration	ASTM E2412
Elemental Analysis (wear metals, contaminants, and additives)	ASTM D5185
Karl Fischer	ASTM D6304
Particle Count for Fluid Cleanliness (ISO 4406)	ASTM D7596
RPVOT	ASTM D2272
RULER	ASTM D6971
Rust A Distilled Water	ASTM D665
MPC Varnish	ASTM D7843
Viscometer 40°C cSt	ASTM D445
Visual/Crackle	ASTM D7690
Wear Particle Analysis	ASTM D7690



Other Testing Services



TRANSFORMER TESTING

Transformer lubricant analysis provides customizable testing programs to adapt to each transformer's unique needs. Transformer downtime or failures present major safety risks, high repair costs, and extended downtime. Trico's testing program utilizes a vast array of testing to identify possible problems such as contact arcing, aging insulation, and latent faults.



COOLANT TESTING

Controlling equipment temperature is necessary for optimum operating performance. Trico's coolant analysis alerts you to coolant breakdowns that may contribute to engine failures. Our trained technicians measure your coolant's freezing point, boiling point, and contamination levels in order to help you make seasonal change-out decisions.



FUEL TESTING

Fuel quality is essential to proper and cost-efficient engine operation. Long-term storage and transfer of fuels can result in water, sludge, or organic contamination. Chemical and physical properties may also deteriorate. Fuel contamination and degradation are often the cause of diesel engine failures. Trico's fuel analysis service provides information to help you maintain the highest engine performance. These tests allow you to screen out poor quality stocks and ensure that your fuel meets regional and seasonal operating requirements.

Wear Debris Analysis (Ferrography)

BENEFITS:

- ✓ Determine start of abnormal wear
- ✓ Assess the severity, origin, and development mechanism of particles
- ✓ Evaluate particles contaminating the lubricant sample
- ✓ Predict equipment wear condition and failure potential
- ✓ Qualitatively determine the size, shape, composition, and concentration of particles
- ✓ Identify the source of wear
- ✓ Determine lubricant life
- ✓ Particle analysis 0-300 microns

Trico is the pioneer in Wear Debris Analysis (Ferrography). Our service provides accurate insight into the condition of an equipment's lubricated components by examining wear particles and contaminants suspended in the fluid – including grease and water-based fluids. These particles can reveal abnormal wear, components involved, and the cause. Our predictive analysis will identify wear-related conditions at an early stage, preventing catastrophic equipment failure. Trico reduces repair costs by diagnosing maintenance requirements before extensive equipment damage and unscheduled shutdown occur.

DIRECT READING FERROGRAPHY

Direct Reading Ferrography magnetically separates wear particles and optically measures the quantity of large and small particles present in the oil sample. Results from direct reading ferrography indicate the rate, intensity, and severity of wear. With these measurements, machine wear baselines can be established and trends in wear conditions can be monitored. If there is a significant increase in the wear trend levels, a detailed analytical ferrography should be performed.

ANALYTICAL FERROGRAPHY

When Direct Reading Ferrographs and/or other analysis indicate abnormal wear, Trico's Analytical Ferrography can further pinpoint its source and the specific type of wear. Our skilled analysts will extract, classify, and visually analyze wear particles and solid contaminants. Particles are examined under a powerful optical microscope to determine the size, concentration, color, shape, and particle composition. Results received from Trico's analytical ferrography provide for the application of timely, corrective maintenance, based on a machine's actual condition.



Trico Oil Analysis Lab ISO Certifications



Trico is committed to providing quality oil analysis services. To meet this high level of quality our lab is ISO 9001:2015 certified and ISO/IEC 17025:2017 accredited which means we implement a quality system that is aimed at improving our ability to consistently produce valid results for our customers. ISO/IEC 17025:2017 is an International Standard designed for the accreditation of Testing and Calibration Laboratories. It includes quality management system requirements along with technical requirements to ensure that each laboratory is equipped to perform particular tests and calibration activities.

- ISO 9001:2015
- ISO/IEC 17025:2017

BENEFITS:

- ✓ Demonstration of a well-established quality management system producing reliable and competent test and calibration results
- ✓ Reduction of the amount of regulatory assessments required
- ✓ Competitive advantage in the marketplace
- ✓ International recognition of test and calibration reports

A Few Of The Industries We Service

- ✓ Aerospace
- ✓ Automotive
- ✓ Chemical
- ✓ Construction
- ✓ Food and Beverage
- ✓ General Manufacturing
- ✓ Marine
- ✓ Metal and Fabrication
- ✓ Mining
- ✓ Oil & Gas
- ✓ Pharmaceutical
- ✓ Power Generation
- ✓ Pulp and Paper
- ✓ Waste Management Facilities
- ✓ Wastewater and Water Treatment



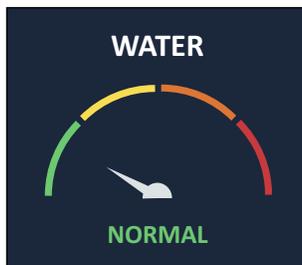
Orbital - Trending and Diagnostics

Orbital...where oil analysis ends, and oil intelligence begins.

Orbital allows you to compare variables across your process including environment, practices, and equipment setups to identify the factors compromising your oil's condition and equipment's performance.

Doing dimensional sampling at predefined locations across your oil's journey and paired with mobile application data input provides you variable filters within Orbital to evaluate and pinpoint where and what is having the greatest impact on your program. You're able to evaluate sample results from equipment inside compared to outside, by equipment or lubricant type, or by sample methods and locations creating clarity about where to focus initiatives to address your greatest problems.

It's not just oil analysis anymore; it's oil intelligence.



DETECT

Problem areas

ANALYZE

Deviations from the norm

DIAGNOSE

Issues and risks

ACT

With insights to make decisions

Orbital helps you see the commonality between small and vast amounts of information.



CORRELATION

See the relationships between data using factors such as operating environment, your practices, equipment type, and lubricant type.



VISUALIZATION

The data is displayed in simple, visual formats such as charts, graphics, and tables for ease of analysis and interpretation.



ANALYSIS

Provides the capability to categorize, manipulate, and summarize data to find trends and relationships.



INTERPRETATION

Allows you to see the meaning of your data to make the necessary decisions needed for the most appropriate maintenance action.

Orbital...the Possibilities

INCREASE EQUIPMENT AVAILABILITY

Quickly see equipment that needs attention, so you can focus directly on the issue.

UNCOVER BAD ACTORS

Find trends using in-depth data correlation, enabling you to fine-tune equipment performance and identify habitual bad actors.

ANTICIPATE FAILURES

Anticipate failure risks with more data, so you can prevent problems before they occur.

TREND HISTORICAL DATA

Benchmark and track data to make real, sustainable improvements that have a profound impact on multiple areas of your reliability program.

GAIN CONTROL

Full control to easily update and add new equipment and lubricant information.



JOURNEY SCORE

Provides insight into your practices through the Journey of the Lubricant based on dimensional sampling and information provided on lubricant quality, protection practices, contamination ingress, and equipment protection.



MOBILE APP

Orbital Mobile App provides an easy method to edit sample information and submit it to the lab with no paperwork. Once the sample bottles are received by the lab you will receive notification when testing is in progress and complete.



CONDITION REPORTS

Detailed report that contains vital information about the condition of the lubricant and equipment. The report provides overall findings and recommendations from the lab.

Orbital - Journey of the Lubricant Score

Problems Begin Across Five Stages of Your Lubricants' Journey

The Journey of the Lubricant Score provides insight into your practices based on dimensional oil sampling and information you provided on your Equipment Data Sheet (EDS). The scores are broken down by the 5 stages of the Journey of the Lubricant: Arrival, Storage, Transfer, Application, and Lifecycle. The scores include an Overall Score which is an average of the five Journey of the Lubricant stages. The scores are based on the following key factors:

FLUID QUALITY

Your oil analysis results are used to indicate the condition of your lubricant and its ability to perform as required by the equipment's application.

PROTECTION PRACTICES

What types of practices you have in place to protect your lubricant from degradation.

CONTAMINATION INGRESSION

What methods you are using to protect your lubricant from water, particulate, and cross contamination.

EQUIPMENT PROTECTION

What methods do you have in place to protect your equipment from environmental conditions and the frequency you are performing oil analysis.

JOURNEY SCORE

Provides overall Journey of the Lubricant score based on your program practices and oil analysis results.

STAGE SCORE

Your results for each stage within the Journey of the Lubricant.

IMPROVE SCORE

An area to add/update answers that pertain your practices based on fluid quality, protection practices, contamination ingress, and equipment protection.

SOLICIT HELP

Email another person on your team to fill in the blanks to help you improve your score. We will email them the question(s) and copy you on their answers.

TROUBLESHOOTING GUIDANCE

Provides feedback on how to improve your score with detailed explanations.

OVERALL SCORE



ARRIVAL



STORAGE



TRANSFER



APPLICATION



LIFECYCLE



Orbital - Condition Summary

Orbital - Condition Summary

Manage all the equipment and lubricant in your oil analysis program through Orbital.

JOURNEY ANALYSIS

Drill into your data using different parameters

FILTER

Locate just one sampling point or filter by a variety of parameters

ALERTS

View alerts that need immediate attention

The screenshot displays the 'Condition Summary' interface for 'ABC COMPANY' (Site ID: P2650). It features a navigation sidebar on the left and a main content area. At the top, there's a 'FILTERS' button. Below that are four action buttons: 'PRINT LABELS', 'NEW ANALYZE JOURNEY', 'ADD NEW SPID', and 'ADD NEW REFERENCE OIL'. A 'RED ALERT!' notification is shown with the text 'This red box is not good. Proceed with caution.' and a 'CALL TO ACTION' button. The main data table is titled 'GEARBOX - GENERAL' and lists various equipment items with their respective analysis data.

SPID	SPID NAME	SPID DESCRIPTION	SAMPLES	MODULE	COMPONENT	PROGRAM	JUN20	JUL20	AUG20	SEPT20
36407	Vac. Pump #3 Gearbox	100-240-64	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36421	Vac. Pump #2 Gearbox	100-240-63	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36421	Lube-unit Yankee Gearbox	100-020-15	7 of 12 (58%)	-	Gearbox - General	H002T	🟢	🟢	🟢	🟢
36425	Drive-Forming Roll	100-265-18	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36427	Drive-Reel Drum	100-265-21	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36430	Vacuum Pump #1	100-240-62	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36433	Agitator HW Dump	010-230-14	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36433	Agitator Felt Side Mach	010-230-28	7 of 12 (58%)	-	Gearbox - General	H002T	🟢	🟢	🟢	🟢
36433	Sewell Disc	010-230-04A	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36434	Hydrapulper	010-210-05	7 of 12 (58%)	-	Gearbox - General	H002T	🟡	🟡	🟡	🟡
36438	Small Gear Unit	010-230-04B	7 of 12 (58%)	-	Gearbox - General	H002T	🔴	🔴	🔴	🔴

LABELS

Print bar-coded bottle labels online

SPID DETAILS

Maintain accurate and up-to-date data points

DATA POINTS

Quickly and easily add new sampling points and reference oils

CONDITION REPORT

Provides analysis overview and access to individual reports

Bringing you accurate, real-time lubricant and equipment condition data.

Orbital Mobile App



POWER AT YOUR FINGERTIPS

Orbital Mobile App

Download the Orbital Mobile App to easily manage and submit your oil samples.

- ✓ No more paperwork - edit sample information prior to submitting them online
- ✓ Lab is notified when sample information has been submitted
- ✓ No internet, no problem - enter information offline, once you're back online your information will sync
- ✓ Receive notifications when samples are received, in testing, when complete, and when report is ready to view

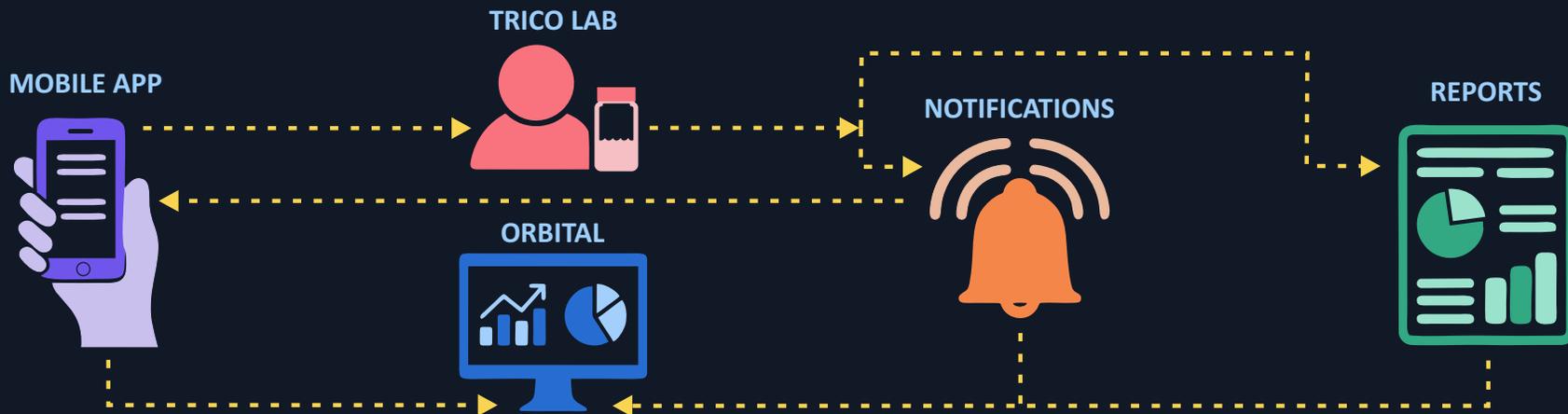


Use QR code to download app or search Trico Orbital in the App Store or Google Play.

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HOW DOES THE APP WORK



✓ Information is entered into the mobile app

✓ Trico is notified when sample(s) is (are) submitted

✓ Orbital Platform is updated with new information from mobile app

✓ Notifications are sent to mobile app and Orbital Platform when samples are received by Trico lab and are in processing

✓ Oil Analysis Condition Report is available on Orbital Platform

✓ Notification is sent to mobile app indicating report is ready for viewing



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ISO/IEC 17025:2017 Accredited

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