SESSION

BRÚJULA

CONGRESO DE MANTENIMIENTO & CONFIABILIDAD MÉXICO 16 EDICIÓN

Presentation of a successful experience, case study, or project.

In the Brújula Session, you will learn from the shared experience of a successful implementation that will serve as a guide to initiate or improve your own plans.

Solve problems and improve your reliability through the implementation of new methodologies and technologies, understanding the origin, analysis, action plan, step-by-step process, achievements, setbacks, and lessons learned that culminate in the business case.

BRÚJULA
SESIÓN

¡Battle Tested Steps to Getting Lubrication Right!

Jim Fitch
Presidente de Noria Corporation

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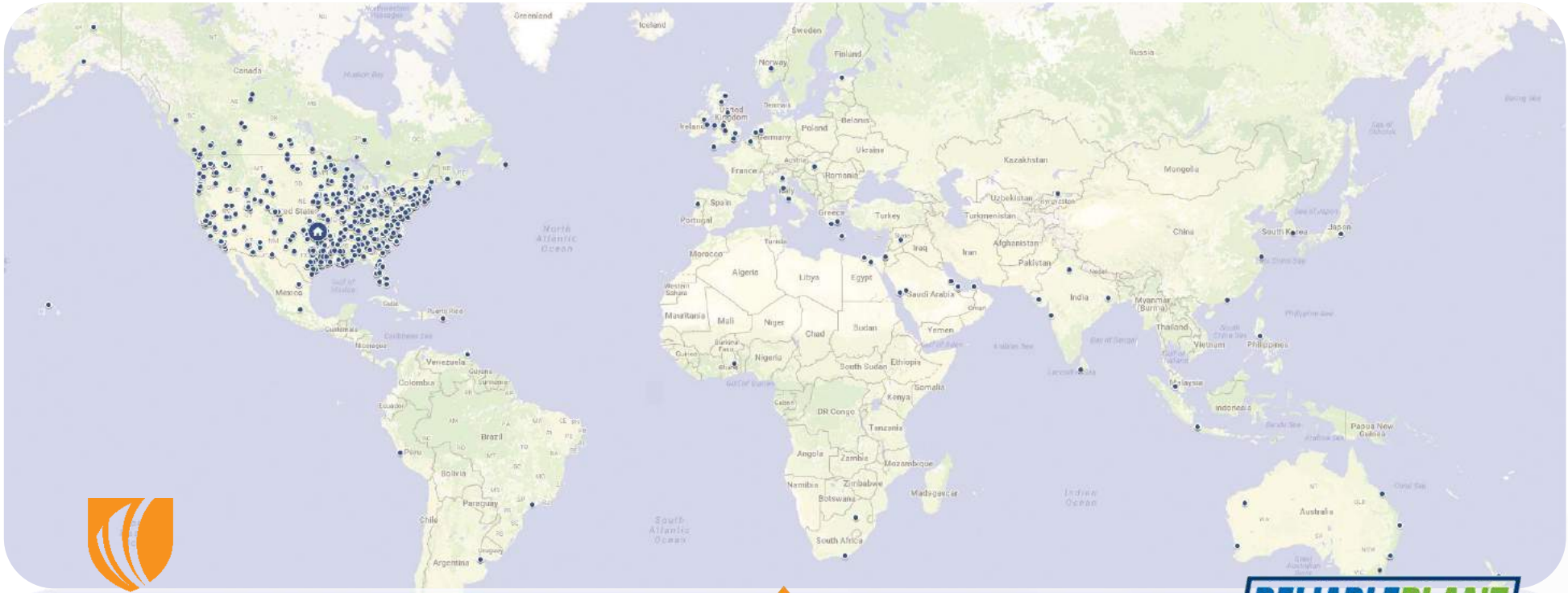
NORIA

For 25 Years, Global Provider of Machinery Lubrication and Oil Analysis Education, Consulting, Publishing and Events.

- International Partners • 40+ Countries • 11 Languages
- 30+ Different Countries Attend Reliable Plant Conference
- This is our 25th Conference Year, Orlando, August
- 200+ Public Training Locations Annually
- Over 100,000 people Trained
- 1000+ Lubrication Program Development (LPD) Projects



NORIA ACADEMY

ASCEND™

LubePM™

RELIABLEPLANT CONFERENCE & EXHIBITION

NORIA

Noria was Founded on the Premise that …

- Maintenance is the No. 1 most controllable expenditure in a plant
- Every plant has a hidden plant that must be found
- Lubrication is the No. 1 cause of machine wear and failure
- There is no greater influence on the state of lubrication than training and human behavior
- All progress depends on change and change must be enabled

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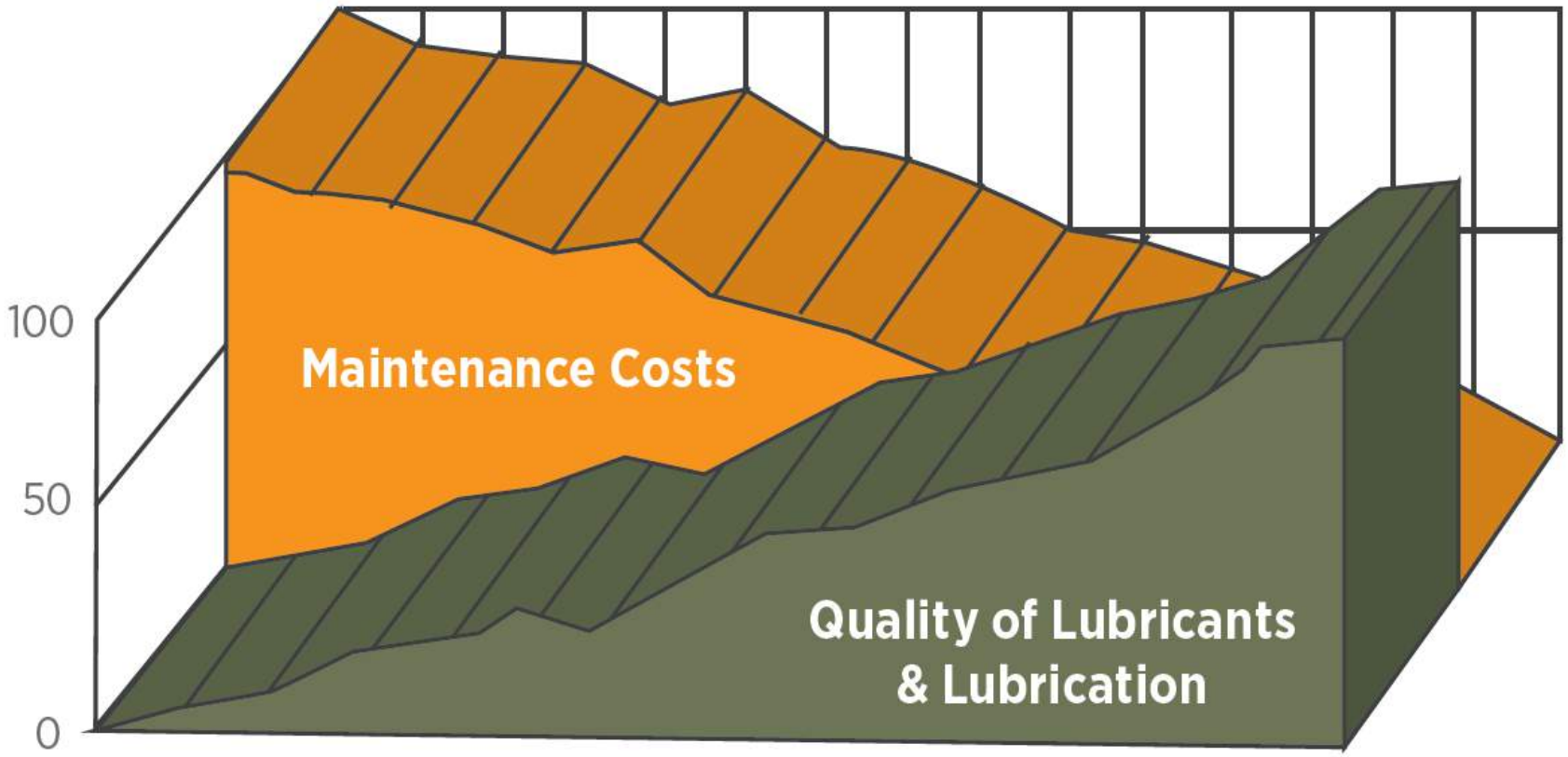
Someone Once Told Me Reliability
was about ***80% Culture***
and 20% Everything Else

ICML 55, an Asset Management Standard that Gets Lubrication Right

- Tactical, lubrication-specific standard, aligns to ISO 55000
- Consensus product of 48 worldwide experts
- Categorizes 12 interrelated areas to be incorporated into any sustainable lubrication program.

The Big Twelve: Interrelated Areas to be Incorporated into any Sustainable Lubrication Program
Skills: Job Task, Training, and Competency
Machine: Machine Lubrication and Condition Monitoring Readiness
Lubricant: Lubricant System Design and Selection
Lubrication: Planned and Corrective Maintenance Tasks
Tools: Lubrication Support Facilities and Tools
Inspection: Machine and Lubricant Inspection
Lubricant Analysis: Condition Monitoring and Lubrication Analysis
Troubleshoot: Fault/Failure Troubleshooting and RCA
Waste: Lubricant Waste Handling and Management
Energy: Energy Conservation and Environmental Impact
Reclaim: Oil Reclamation and System Decontamination
Management: Program Management and Metrics

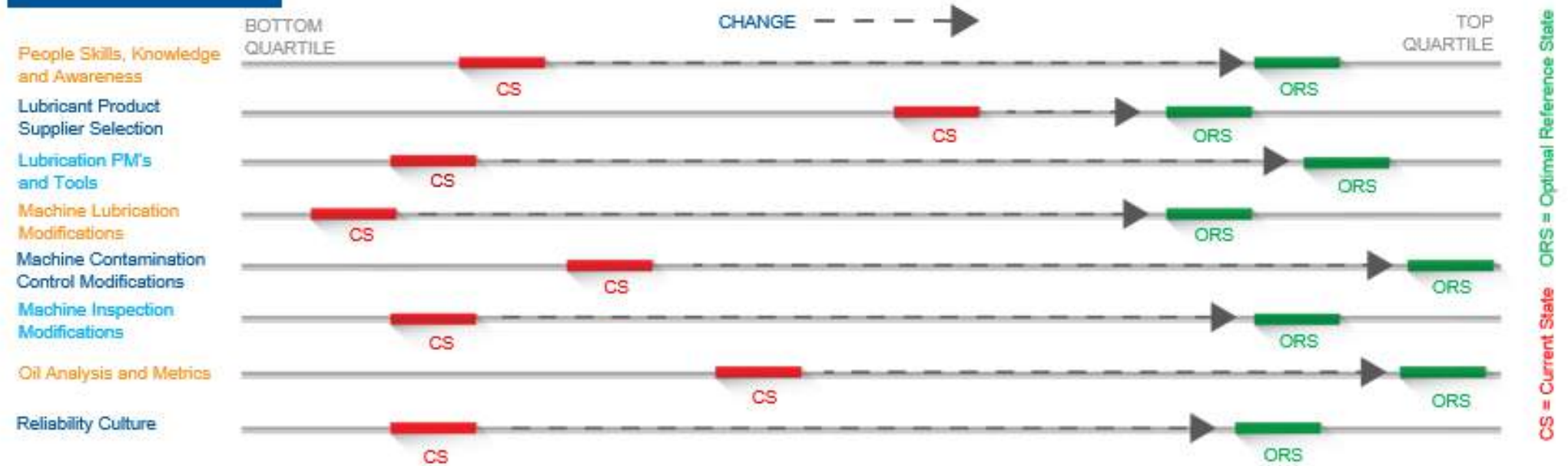
Cause and Effect



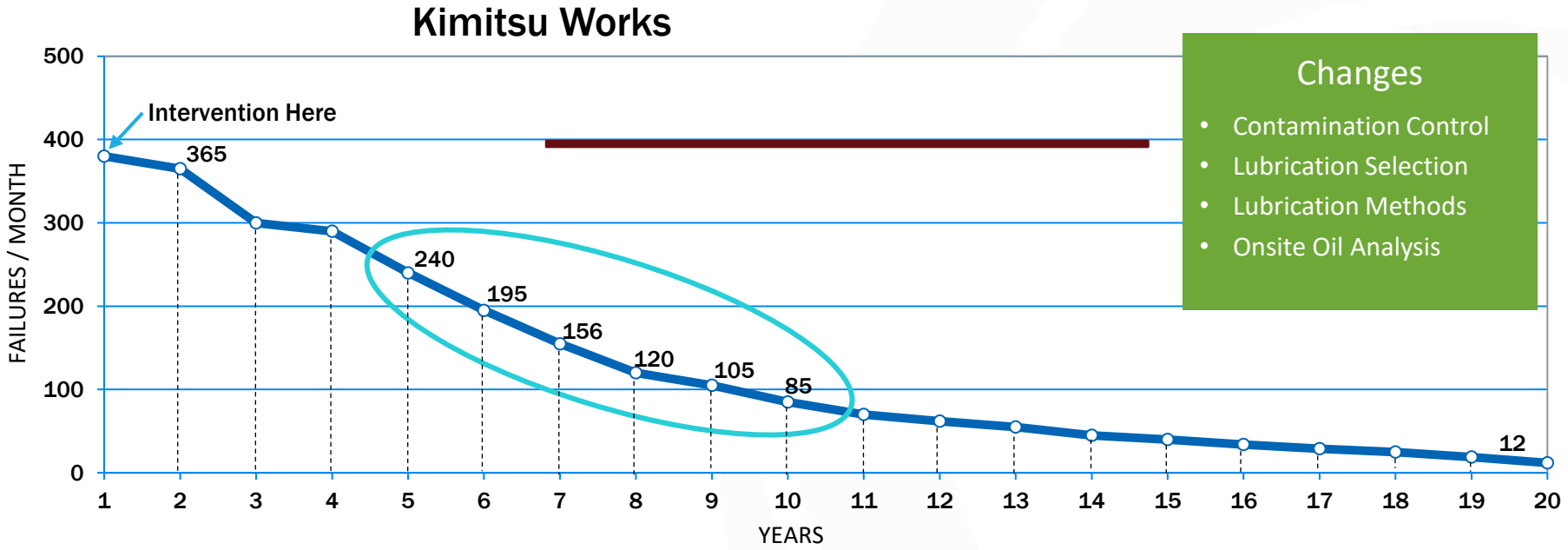
The Rewards of Action and Change

What You Want

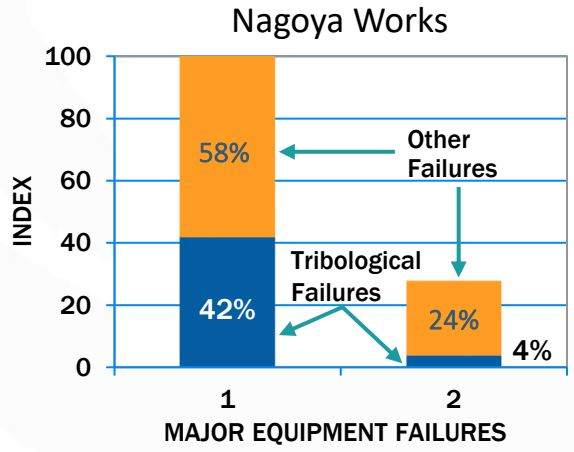
How You Get It



Nippon Steel: Test Case



- Kimitsu Works achieved a 65% bearing failure rate reduction in a six-year time period
- Nagoya Works achieved 90% reduction in wear-related failures
- Principle Strategy - improved lubrication
- Kimitsu Works - winner of the Total Productive Maintenance (TPM) Excellence prize



The Optimum Reference State… Defined

The Optimum Reference State is the prescribed optimum state of machine configuration, conditions and maintenance activities required to achieve and sustain reliability objectives. It needs to be precise, definable, measurable or verifiable. Vagueness doesn't work. Finally, it needs to be controllable,

Example Lubrication Reference States:

People Preparedness: training (good), certification (better) and skills standards (better)

Machine Preparedness: inspection, lubrication, contamination control, oil sampling instrumentation

Precision Lubricants: (what you buy) base oil type, viscosity, additives, performance properties

Precision Lubrication: (what you do) procedure, frequency, amount, location

Oil Analysis (health): lab selection, test slate, frequency, alarms, troubleshooting

The ORS is an engineering specification for lubrication excellence.

The Guide to Lubrication Excellence

Lifecycle Stage 6

Energy Conservation, Health & The Environment (E)

E1P	Energy Conservation, Health & Environmental Impact
E2P	Storage & Disposal of Used Oil & Materials
E3M	Leakage Management
E4M	Energy Conservation, Health & Environmental Training
E5K	Energy Conservation, Health & Environmental KPIs

Lifecycle Stage 5

Condition Monitoring, Lubricant Analysis & Troubleshooting (A)

A1P	Machinery Selection for Condition Monitoring & Lubricant Analysis Program
A2P	Lubricant Analysis Test Slate—Periodic & Online
A3P	Lubricant Analysis Data Source Selection—Onsite Lab, Offsite Lab & Online Sensors
A4P	Sampling Tools & Methods
A5M	Selection & Integration of Inspection & Condition Monitoring Tasks
A6M	Lubricant Analysis Data Limits Selection & Interpretation
A7M	Troubleshooting & Root Cause Analysis
A8M	Condition Monitoring, Lubricant Analysis & Troubleshooting Training
A9K	Condition Monitoring, Lubricant Analysis & Troubleshooting KPIs

Lifecycle Stage 4

Contamination Control & Lubricant Reconditioning (C)

C1P	Contaminant Exclusion
C2P	Contaminant Removal & Lubricant Reconditioning
C3M	Contamination Control Objectives
C4M	Contamination Control & Lubricant Reconditioning Training
C5K	Contamination Control & Lubricant Reconditioning KPIs

Lifecycle Stage 1

Lubricant Selection (S)

S1P	Lubricant Selection Process
S2P	Lubricant Supplier Selection
S3P	Lubricant Identification System
S4M	Consolidation & Optimization
S5M	Lubricant Selection Training
S6K	Lubricant Selection KPIs

Lifecycle Stage 2

Lubricant Reception & Storage (R)

R1P	Quality Control Process
R2P	Lubricant Storage & Lube Room
R3P	Lubrication Safety Practices
R4M	Inventory Management
R5M	Reception & Storage Training
R6K	Reception & Storage KPIs

Lifecycle Stage 3

Lubricant Handling & Application (H)

H1P	Lubricant Application Tasks
H2P	Machinery Configuration
H3P	Lubricant Handling & Application Devices
H4M	Lubrication Program Management
H5M	Lubrication Routes
H6M	Machinery Inspection Tools & Practices
H7M	Goals & Rewards System
H8M	Lubricant Handling & Application Training
H9K	Lubricant Handling & Application KPIs

ICML 55.1 Subjects		ASCEND™ FACTORS
1	Skills	S5M, R3P, R4M, R5M, H7M, H8M, C4M, A8M, E4M
2	Machine	S3P, R3P, H2P, H6M, C1P, C2P, A4P, E3M
3	Lubricant	S1P, S2P, S3P, S4M, S6K, R2P, E4M
4	Lubrication	R1P, R4M, R5M, H1P, H2P, H3P, H4M, H5M, H6M, C1P, E3M
5	Tools	R1P, R3P, H2P, H3P, H6M, C1P, C2P, A4P, E2P, E3M
6	Inspection	R3P, R4M, H5M, H6M, C1P, C2P, A2P, A4P, A5M, E3M
7	Lubricant Analysis	R2P, H5M, H6M, A1P, A2P, A3P, A4P, A5M, A6M, A8K
8	Troubleshooting	H5M, H6M, C1P, C4M, A5M, A6M, A7M, E3M
9	Waste	S4M, R1P, R3P, R4M, C1P, C2P, E2P, E3M
10	Energy	S1P, H2P, H3P, C3M, E1P, E5K
11	Reclaim	R3P, R4M, C2P, C3M, A2P
12	Management	S2P, S6K, R2P, R3P, R4M, R6K, H4M, H7M, H9K, C3M, C5K, A3P, A7M, A9K, E2P, E5K

The table above cross-references the 12 central subjects of the ICML 55.1 standard to the 40 Factors of the ASCEND™ Chart. ICML 55.1 is a standard published by the International Council for Machinery Lubrication entitled Asset Management Requirements for the Optimized Lubrication of Mechanical and Physical Assets. This standard was developed by the collaborative contributions of 45 subject matter experts in lubrication, lubricant analysis, condition monitoring, reliability, maintenance and asset management. The cross-reference in this table unifies the 40 ASCEND™ Factors to the requirements for certification to ICML 55.1.
More information on this standard is available at lubecouncil.org.

The ASCEND™ Chart

3 Levels • 6 Lifecycle Stages • 40 Factors

Backed by years of proven experience, Noria's ASCEND™ Chart is an effective tool for evaluating the current state of your lubrication program against world-class standards. The ASCEND™ Chart consists of three levels: Platform, Management and Training, and KPIs. These levels are divided into six lifecycle stages, starting with Lubrication Selection and contain 40 factors. The ASCEND™ Chart provides a quick and efficient visual representation to aid your lubrication program transformation. **See noria.com/ascend for detailed use of the chart.**

Noria

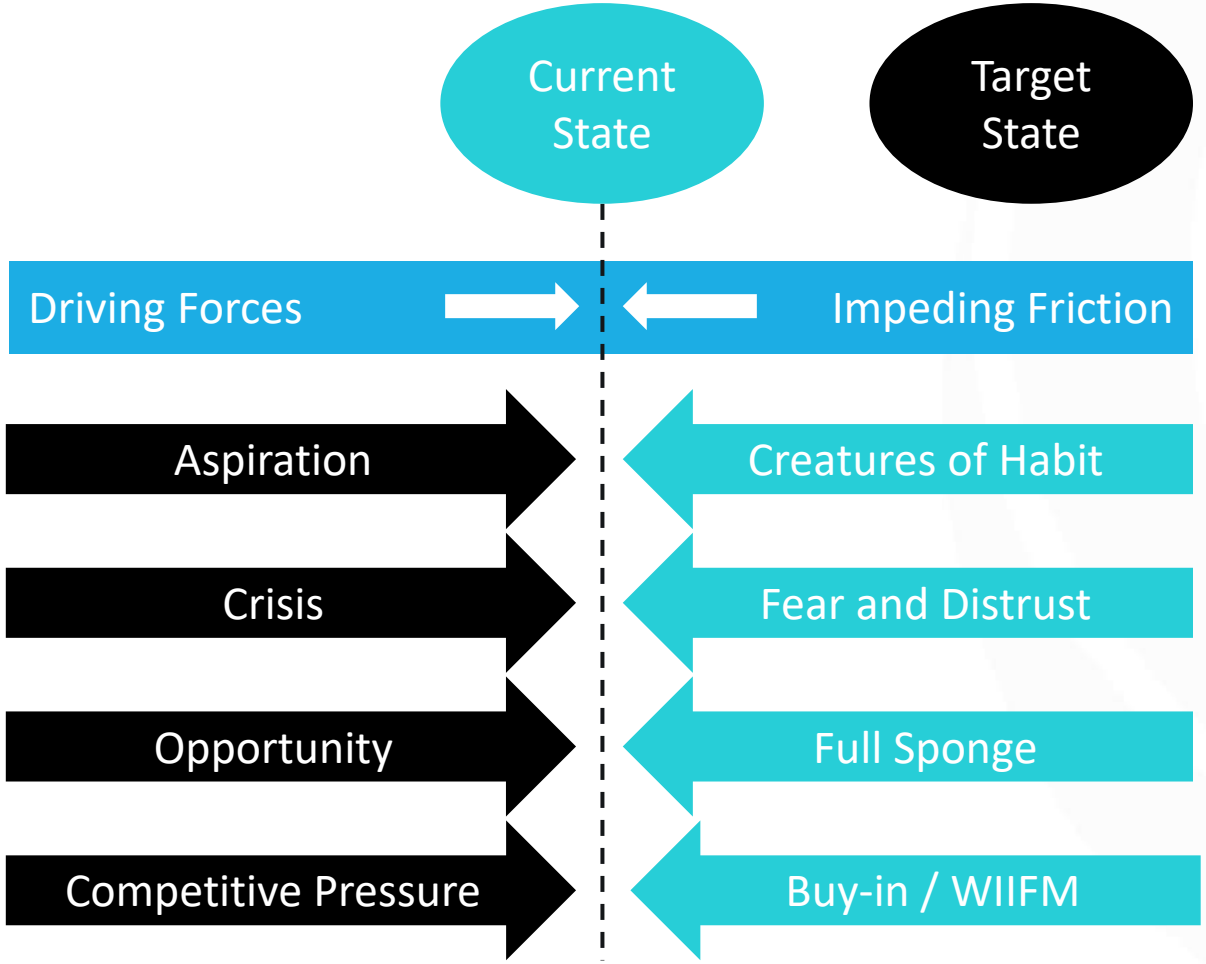
noria.com | 800-597-5460

Core Attributes of Lubrication Excellence

1. Machines Fail and Waste Occurs

Because of What
People Do… and What They Don’t Do

A Body at Rest…



Getting Things Unstuck

The body at rest must be acted upon to achieve change and close the gap between the current and desired state.

- Increase driving force
- Decrease restraining force (Impedance)

“70% of Production Losses are due to Human Error”

When people do bad work they feel bad about themselves and their job. When people do good work they feel good about themselves and their job. Training and empowerment enable good work

The Economics of Education

- When it comes to education, a penny saved is not a penny earned, but rather hundreds of dollars forfeited, all for the quest of a penny
- Teach an ounce of prevention
- You earn what you learn!

Cost of Prevention

Cost of Cure

Task-Based Training

The What

The How

The Why

The When

The Where

Operators, Millwrights, Trades

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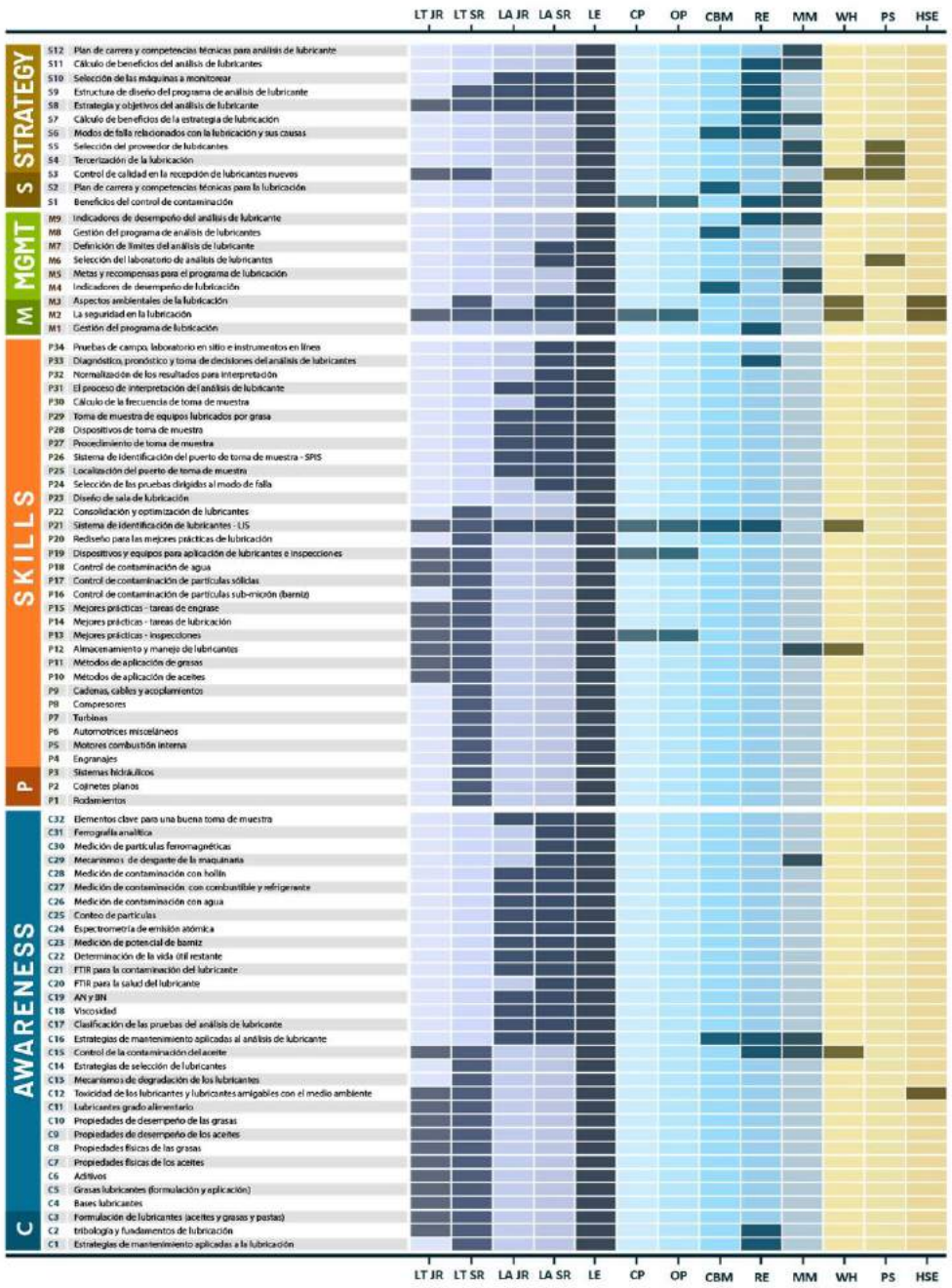


LUBRICATION GENOMA™

LUBRICATION ROLES / ROLES DE LUBRICACIÓN

CLAVE/KEY	ENGLISH	ESPAÑOL
LT JR	Lube Technician Jr.	Técnico en lubricación Jr.
LT SR	Lube Technician Sr.	Técnico en lubricación Sr.
LA JR	Lube Analyst Jr.	Analista de lubricantes Jr.
LA SR	Lube Analyst Sr.	Analista de lubricantes Sr.
LE	Lubrication Engineer	Ingeniero de lubricación
CP	Craftsman	Mecánico
OP	Operator	Operador
CBM	CBM Specialist	Monitoreo basado en condición
RE	Reliability Engineer	Ingeniero de confiabilidad
MM	Maintenance Manager	Gerente de mantenimiento
WH	Warehouse personnel	Almacenista
PS	Purchasing specialist	Especialista de compras
HSE	Health, Safety and Environment Specialist	Salud, seguridad y medio ambiente

NORIA

2. Contamination Control is Fundamental to Machinery and Lubricant Health

Contamination Control and Proactive Maintenance

Modifications are needed to achieve these machine attributes

- **Cleanliness**
- **Dryness**
- **Temperature**
- **De-aerated state**

Proactive Maintenance in Three Easy Steps

1

- Set ORS Cleanliness Targets
- Target Cleanliness Level Should Reflect Reliability Goals

Make “Cleanliness” a Focal Point in Lubrication

2

Take Specific Actions to Achieve Targets (modifications)

1. Reduce Ingression
2. Improve Filtration

Next, Focus on Reducing the Cost of Cleanliness

3

Measure Contaminant Levels Frequently

1. What Gets Measured Gets Done (Step 2)
2. Post Control Charts of Measured Results

- Keep Numbers Conspicuous
- Deploy the Invisible Filter
- Remediate High Particles Counts Immediately

Machine Life-Extension Table

NEW CLEANLINESS LEVEL (ISO CODE)

CURRENT CLEANLINESS (ISO CODE)

	20/17		19/16		18/15		17/14		16/13		15/12		14/11		13/10		12/9		11/8		10/7	
26/23	5	3	7	3.5	9	4	>10	5	>10	6	>10	7.5	>10	9	>10	>10	>10	>10	>10	>10	>10	>10
	4	2.5	4.5	3	6	3.5	6.5	4	7.5	5	8.5	6.5	10	7	>10	9	>10	>10	>10	>10	>10	>10
25/22	4	2.5	5	3	7	3.5	9	4	>10	5	>10	6	>10	7	>10	9	>10	>10	>10	>10	>10	>10
	3	2	5.3	2.5	4.5	3	5	3.5	6.5	4	8	5	9	6	10	7.5	>10	>10	>10	>10	>10	>10
24/21	3	2	4	2.5	6	3	7	4	9	5	>10	6	>10	7	>10	8	>10	>10	>10	>10	>10	>10
	2.5	1.5	3	2	4	2.5	5	3	6.5	4	7.5	5	8.5	6	9.5	7	>10	8	>10	9	>10	>10
23/20	2	1.5	3	2	4	2.5	5	3	7	3.5	9	4	>10	5	>10	6	>10	>10	>10	>10	>10	>10
	1.7	1.3	2.3	1.5	3	2	3.7	2.5	5	3	6	3.5	7	4	8	5	>10	6.5	>10	8.5	>10	10
22/19	1.6	1.3	2	1.6	3	2	4	2.5	5	3	7	3.5	8	4	>10	5	>10	6	>10	7	>10	>10
	1.4	1.1	1.8	1.3	2.3	1.7	3	2	3.5	2.5	4.5	3	5.5	3.5	7	4	8	5	10	5.5	>10	8.5
21/18	1.3	1.2	1.5	1.5	2	1.7	3	2	4	2.5	5	3	7	3.5	9	4	>10	5	>10	7	>10	10
	1.2	1.1	1.5	1.3	1.8	1.4	2.2	1.6	3	2	3.5	2.5	4.5	3	5	3.5	7	4	9	5.5	10	8
20/17			1.3	1.2	1.6	1.5	2	1.7	3	2	4	2.5	5	3	7	4	9	5	>10	7	>10	9
			1.2	1.05	1.5	1.3	1.8	1.4	2.3	1.7	3	2	3.5	2.5	5	3	6	4	8	5.5	10	7
19/16					1.3	1.2	1.6	1.5	2	1.7	3	2	4	2.5	5	3	7	4	9	6	>10	8
					1.2	1.1	1.5	1.3	1.8	1.5	2.2	1.7	3	2	3.5	2.5	5	3.5	7	4.5	9	6
18/15							1.3	1.2	1.6	1.5	2	1.7	3	2	4	2.5	5	3	7	4.5	>10	6
							1.2	1.1	1.5	1.3	1.8	1.5	2.3	1.7	3	2	3.5	2.5	5.5	3.7	8	5
17/14									1.3	1.2	1.6	1.5	2	1.7	3	2	4	2.5	6	3	8	5
									1.2	1.1	1.5	1.3	1.8	1.5	2.3	1.7	3	2	4	2.5	6	3.5
16/13											1.3	1.2	1.6	1.5	2	1.7	3	2	4	3.5	6	4
											1.2	1.1	1.5	1.3	1.8	1.5	2.3	1.8	3.7	3	4.5	3.5
15/12													1.2	1.2	1.6	1.5	2	1.7	3	2	4	2.5
													1.2	1.1	1.5	1.4	1.8	1.5	2.3	1.8	3	2.2
14/11															1.3	1.3	1.6	1.6	2	1.8	3	2
															1.3	1.2	1.6	1.4	1.9	1.5	2.3	1.8
13/10																	1.4	1.2	1.8	1.5	2.5	1.8
																	1.2	1.1	1.6	1.3	2	1.6

300% Increase in Life Extension

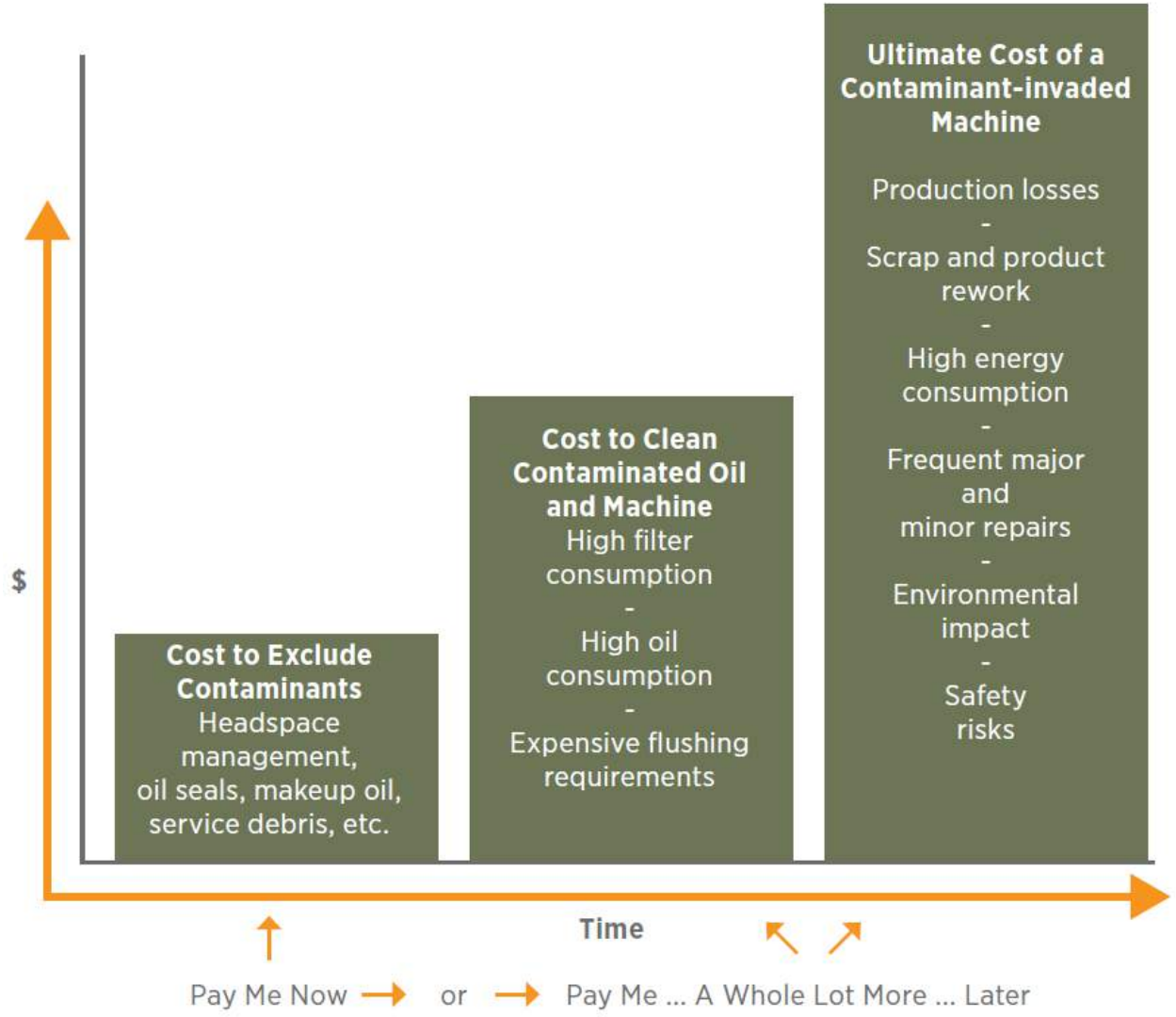
35% Increase in Life Extension

Table Legend

Hydraulics and Diesel Engines	Rolling Element Bearings
Journal Bearings and Turbo Machinery	Gear Boxes and Other

Based on ISO 4406:99 - 4 micron range number has been omitted.

Getting the Waste Out of Contamination Control



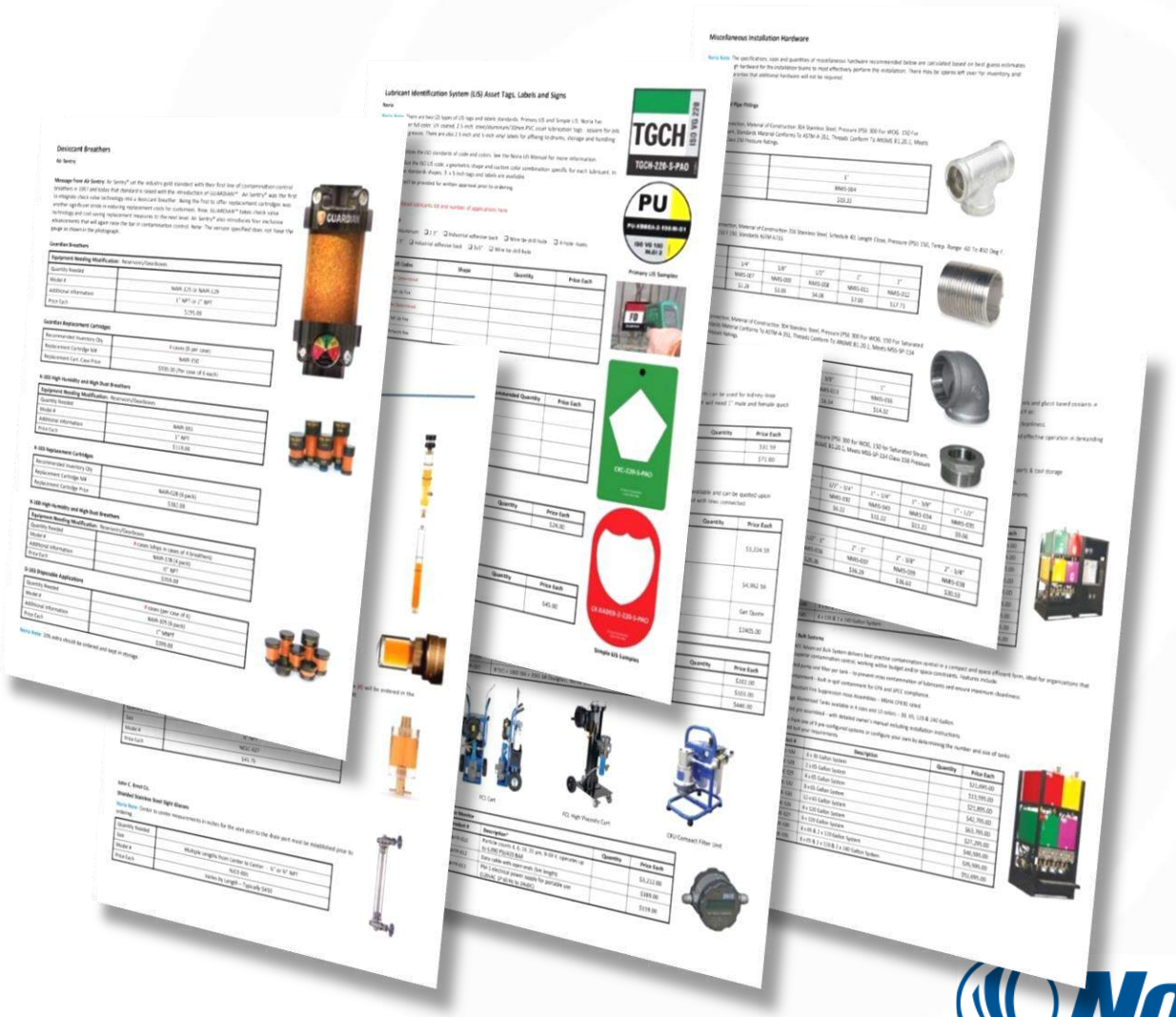
3. Quality Lubrication, Tools and Machine Readiness

Readying machines for wellness and maintainability

As the old-timers are retiring, so must many of their tools and methods

Precision Procedures Define the Optimized Use of Tasks, Skills, Tools and Methods

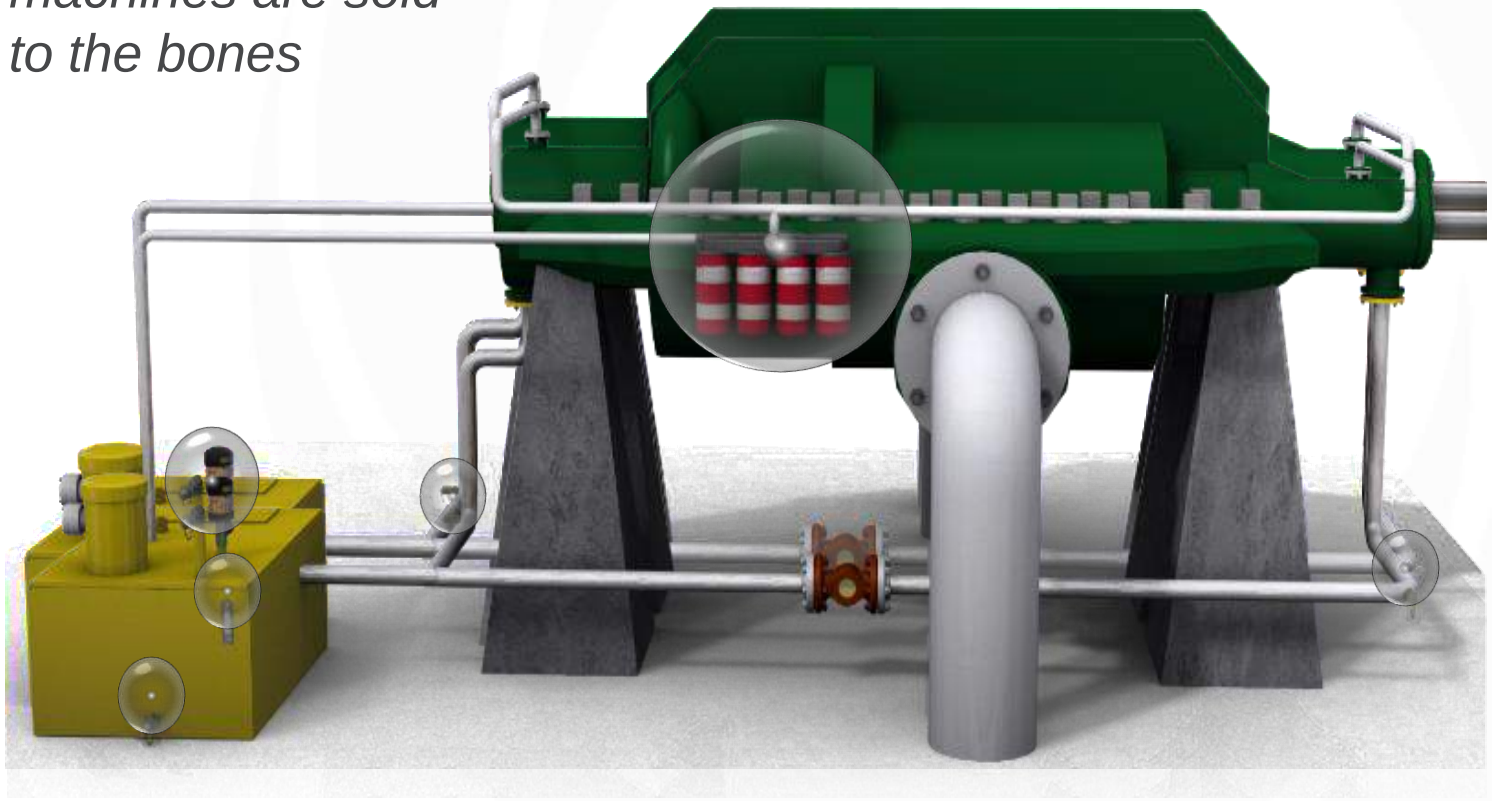
- Storage and Handling
- Inspection
- Lubrication
- Contamination Control



Getting Machine Modifications Right

- Breather
- Oil fill port
- Filtration
- Oil level inspection
- Oil sampling port
- Oil fill method/location

New machines are sold bare to the bones



The Lube Room is the Centerpiece of your Lubrication Program

- Cutting corners builds a culture of mediocracy
- Pigpen lube rooms become pigpen machines
- Be fussy and demanding about the right tools, pumps, hoses, grease guns, dispensing gear, totes, etc.
- Lubrication excellence starts with lube room excellence

Contents of a Well-equipped Lube Room

Ventilation with Filter

Explosion-proof Switches and Lighting

Fireproof Construction

LIS Identification™

Sealed Floor with Non-slip Epoxy Coating

Breather Filters

Oil Dispatch through Filters

Automatic Grease Application Systems (avoids opening grease drums)

Solid Waste Container with Lid

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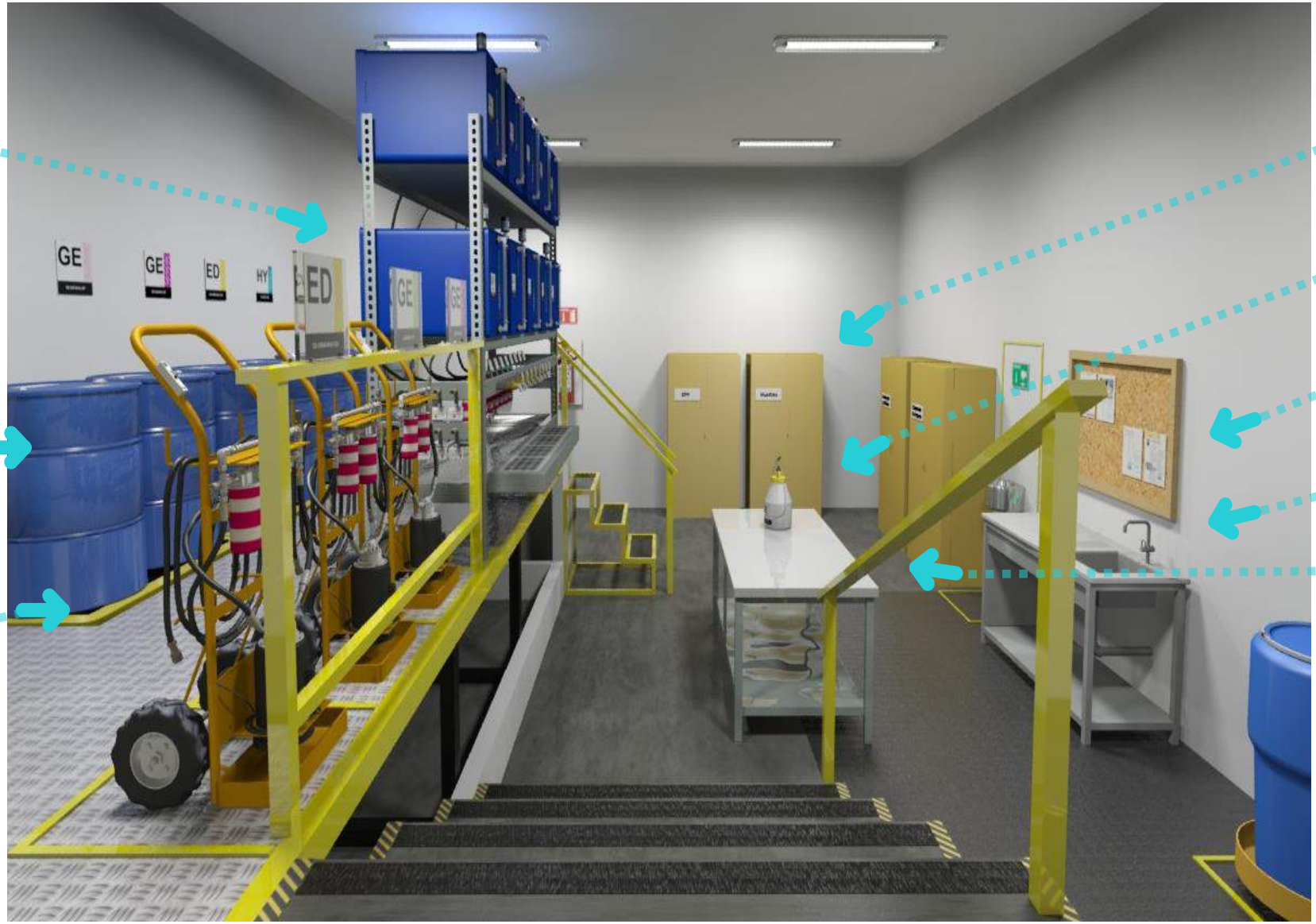

Filtered lubricant containers
Grounded drums
Area for filtration carts
Cabinet with doors
Sealed and clean filling containers
Scoreboard
Washing area
Workbench
Leak containment

4. Getting Lubricant Selection Right

Lubricants are what we buy. Lubrication is what we do

False Economies of Lubricant Selection

The Lure of Cheap Oil

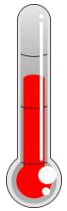
Attempting to save money by buying economy-formulated lubricants for the wrong application

False Promise of Forgiveness

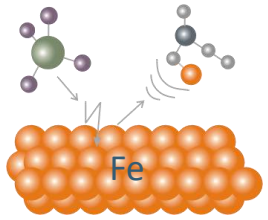
Attempting to remedy bad lubrication practices by buying expensive premium lubricants

The Oil Aging Process…No, It Doesn't Last Forever

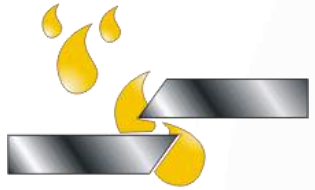
Causes of Oil Aging



Temperature
Stress



Catalysts
(Metal Particles)

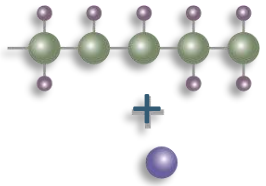


Shear Stress

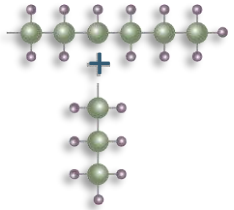
Aeration

Water

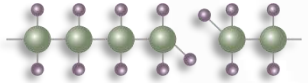
Aging Mechanisms



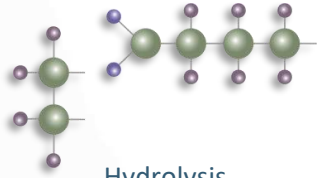
Oxidation



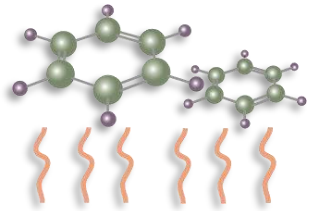
Polymerization



Cracking



Hydrolysis



Evaporation

Which alter fluid properties

Physical	Density, Viscosity	Chemical	Acid Content, Sludge

and decrease useful life

Sludge	Corrosion and Wear

These Lubricant Additives Don’t Exist

- Anti-dirt
- Sludge Pacifier
- Soot Terminator
- Oil Starvation Deactivator
- Cheap Basestock Enhancer
- Excessive Grease Decomposer
- Water Zapper
- Glycol Neutralizer
- Wrong Oil Inhibitor

Finding Real Economies in Your Lubricant Spend

	GEAR OIL	HYDRAULIC FLUID	TURBINE OIL	MOTOR OIL	TOTAL
Current Annual Spending	$70,000	$120,000	$180,000	$40,000	$410,000
1. Precision Optimum-life Lubricant Selection	-$15,000	-$5,000	-$21,000	-$4,000	-$45,000
2. Proactive Lubricant Life Extension	-$13,000	-$3,000	-$12,000	-$3,000	-$31,000
3. Optimizing the Relube Interval	-$6,000	-$15,000	0	-$5,000	-$26,000
4. Reducing Package Waste	-$1,200	-$2,200	0	0	-$3,400
5. Reducing Leakage	-$500	-$22,000	0	0	-$22,500
Optimized Annual Spending	$34,300	$75,800	$147,000	$28,000	$285,100
Percent Cost Reduction	51%	37%	18%	30%	30%
Annual Savings	$35,700	$44,200	$33,000	$12,000	**$124,900**

5. Oil Analysis and Inspection

Constant performance measurement, reporting and course corrections are signs of good maintenance culture

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It's hard for a machine to fail without ***the lubricant knowing about it first***

The Flight Data Recorder in Your Oil

Your Oil is Talking…

But are You Listening?

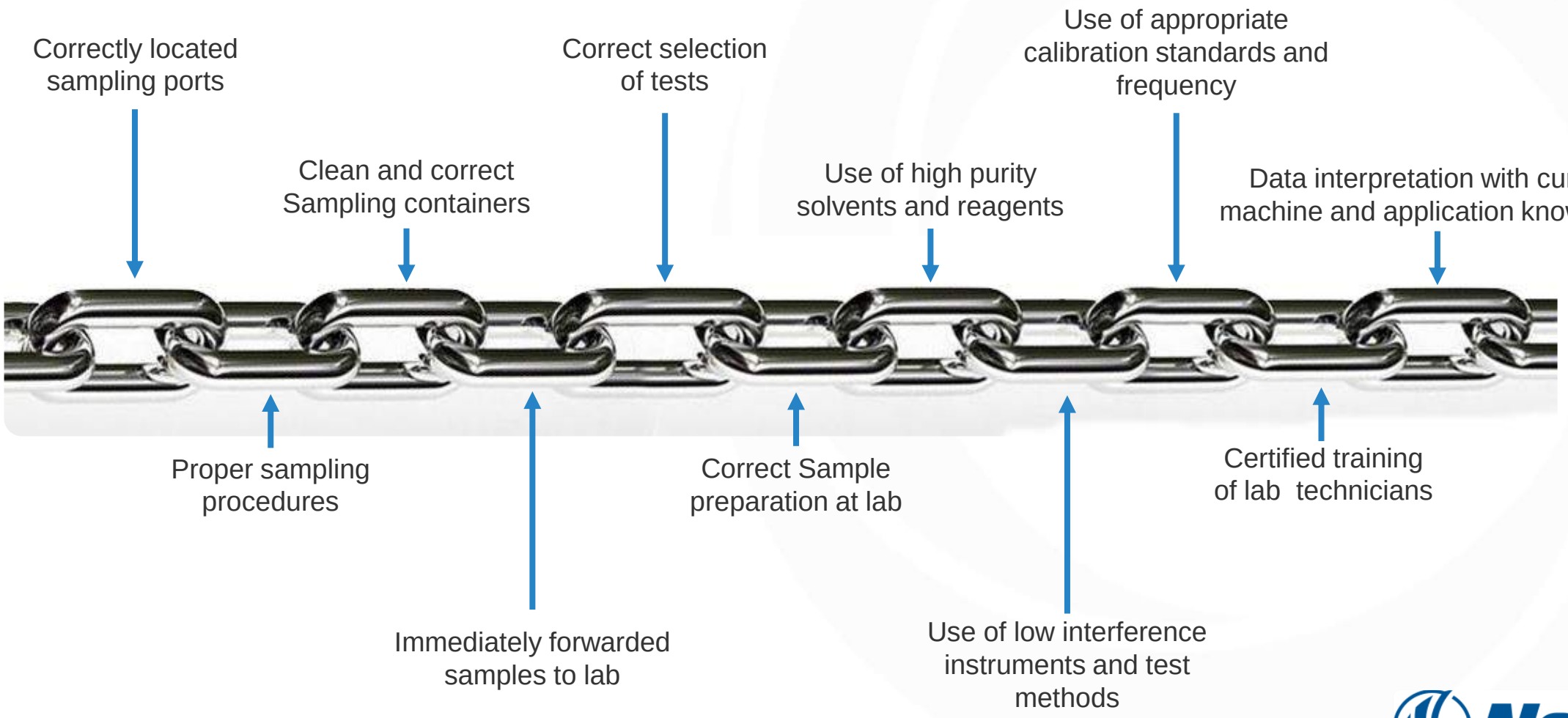
But First, Who's Going to Answer these Questions?

- Right machines to sample?
- Right sampling frequency?
- Right sampling location?
- Right sampling procedure?
- Right lab selection?
- Right tests to perform?
- Right alarms and limits?
- Right data interpretation strategy?

Oil Analysis Done Four Ways… The Optimum Chose is?

Unattended Real-time Sensors	Non-instrument Field Inspections	Portable Field Instruments and Tests	Laboratory Analysis
Sensors are permanent and dedicated to a single machine or group of machines	Frequent & intense examination of sight glasses, magnetic plugs, etc., using multiple sensory techniques	Portable instruments and methods are used at machines, typically without bottle sampling	Bottles are sent to an in-house or commercial lab for analysis
Real-time	Daily	Routine	Periodic

Oil Analysis Integrity Begins with the Sample



Three Categories of Oil Analysis

What is analyzed	1. Fluid Properties Physical and chemical properties of used oil (aging process)	2. Contamination Fluid and machine destructive contaminants	3. Wear Debris Presence and identification of wear particles
Particle counting	○	●	◒
Moisture analysis	○	●	○
Viscosity analysis	●	◒	○
Ferrous density	○	○	●
Analytical ferrography	○	◒	●
AN/BN	●	◒	◒
FTIR	●	◒	○
Patch test	○	●	◒
Flash point	◒	●	○
Elemental analysis	●	◒	●
	Proactive	**Proactive**	**Predictive**

● Primary benefit

◒ Minor benefit

○ No benefit

Remember these Hidden Objects Puzzles from Highlights Magazine?

Can you find the objects on the list?

What if you didn't have the list?

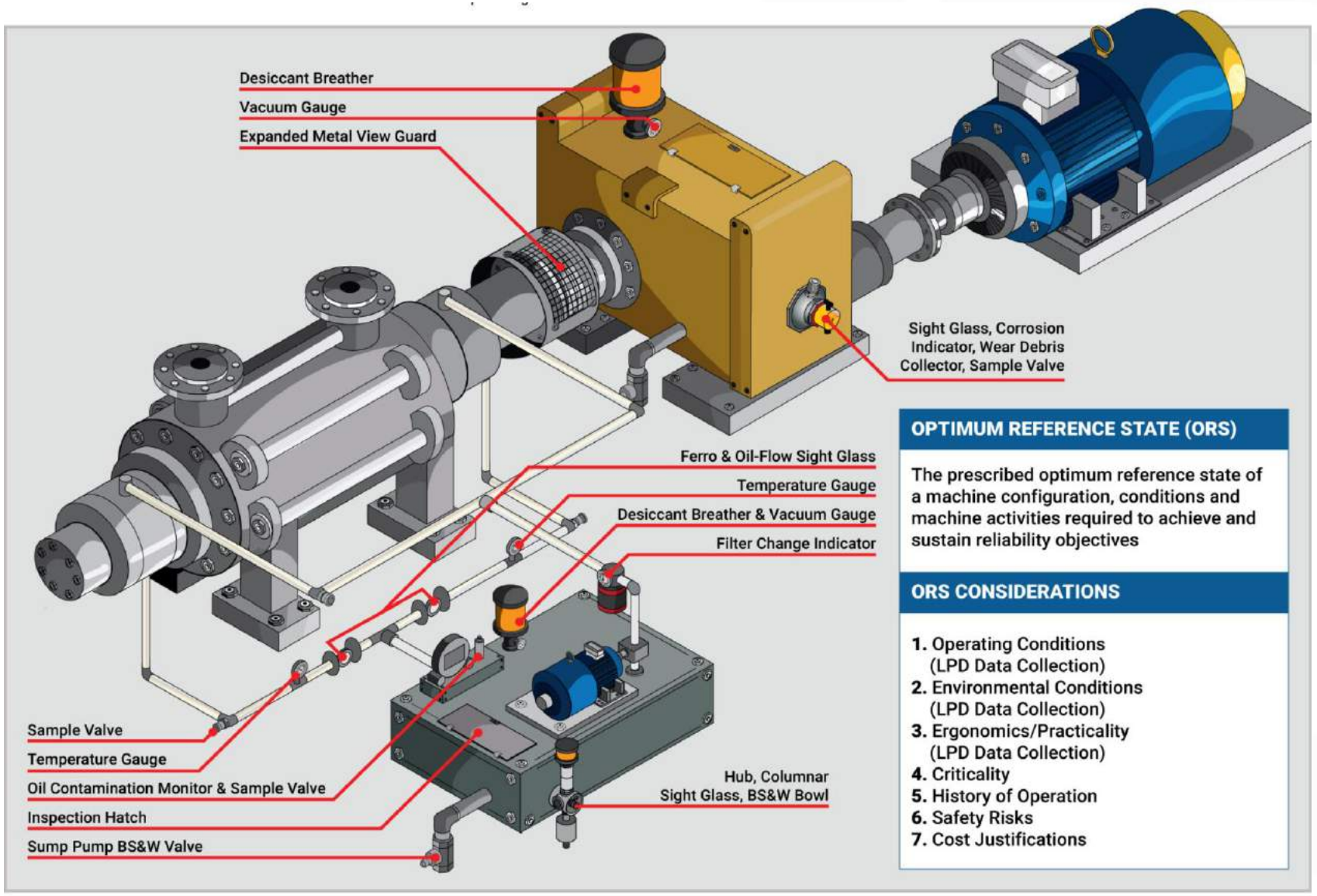
Could a super-computer find them?

- Kite
- Flashlight
- Cowboy boot
- Whale
- Balloon
- Slice of pie
- Bird
- Tea cup
- Compass
- Ice cream cone
- Magnifying glass
- Rhino head
- Banana

Can You See the Ten Reportable Conditions in this Sump?

- How many would have been reported by your current inspection program?
- Or by your laboratory from a sample of oil?
- Or by your vibe program?

Machine Inspection Modifications



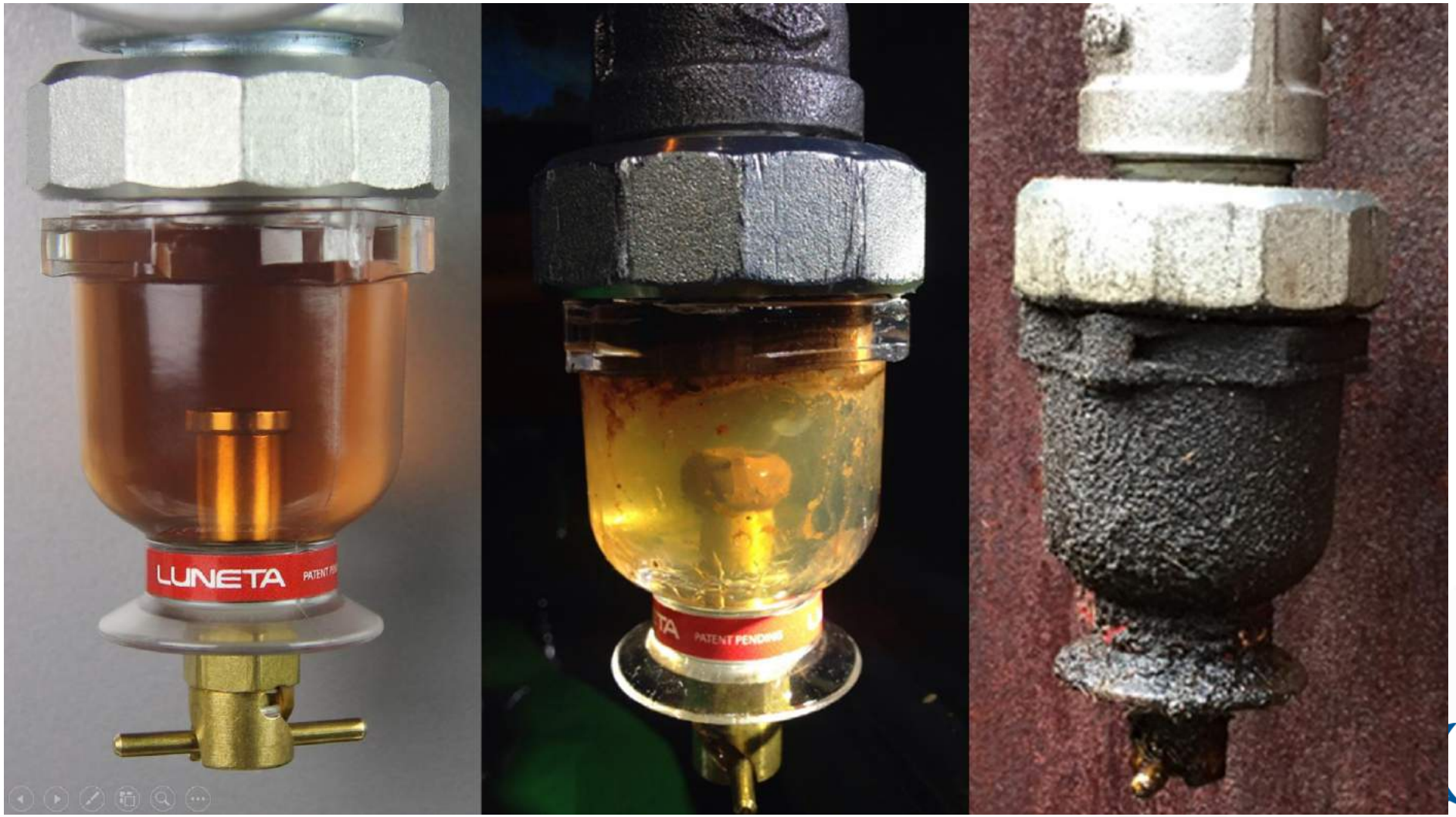
OPTIMUM REFERENCE STATE (ORS)

The prescribed optimum reference state of a machine configuration, conditions and machine activities required to achieve and sustain reliability objectives

ORS CONSIDERATIONS

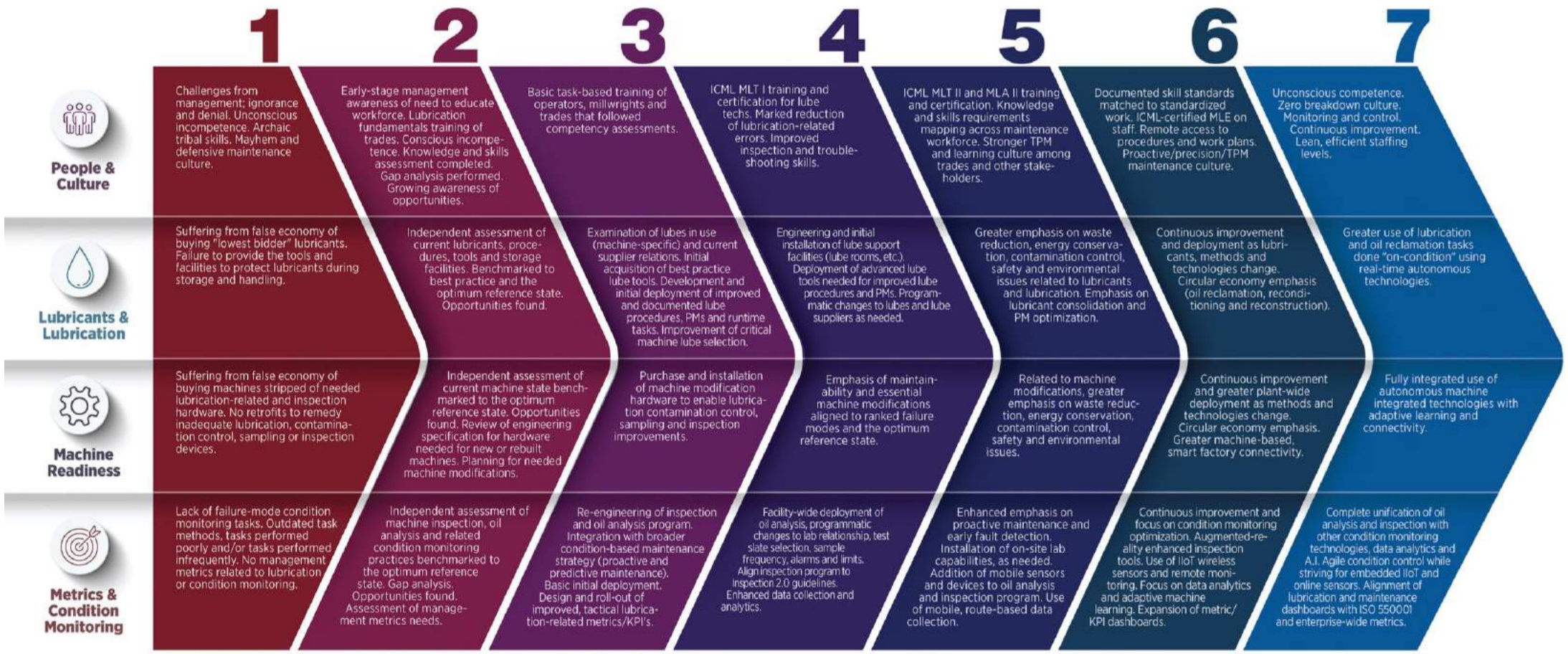
1. Operating Conditions (LPD Data Collection)
2. Environmental Conditions (LPD Data Collection)
3. Ergonomics/Practicality (LPD Data Collection)
4. Criticality
5. History of Operation
6. Safety Risks
7. Cost Justifications

What Should You do Immediately if You Saw These?



Don't Assume They Already Know

A Lubrication Management System (LMS) is the Heartbeat of a Lubrication Program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People & Culture
Challenges from management; ignorance and denial. Unconscious incompetence. Archaic tribal skills. Mayhem and defensive maintenance culture.
Early-stage management awareness of need to educate workforce. Lubrication fundamentals training of trades. Conscious incompetence. Knowledge and skills assessment completed. Gap analysis performed. Growing awareness of opportunities.
Basic task-based training of operators, millwrights and trades that followed competency assessments.
ICML MLT I training and certification for lube techs. Marked reduction of lubrication-related errors. Improved inspection and trouble-shooting skills.
ICML MLT II and MLA II training and certification. Knowledge and skills requirements mapping across maintenance workforce. Stronger TPM and learning culture among trades and other stake-holders.
Documented skill standards matched to standardized work. ICML-certified MLE on staff. Remote access to procedures and work plans. Proactive/precision/TPM maintenance culture.
Unconscious competence. Zero breakdown culture. Monitoring and control. Continuous improvement. Lean, efficient staffing levels.
Lubricants & Lubrication
Suffering from false economy of buying "lowest bidder" lubricants. Failure to provide the tools and facilities to protect lubricants during storage and handling.
Independent assessment of current lubricants, procedures, tools and storage facilities. Benchmarked to best practice and the optimum reference state. Opportunities found.
Examination of lubes in use (machine-specific) and current supplier relations. Initial acquisition of best practice lube tools. Development and initial deployment of improved and documented lube procedures, PMs and runtime tasks. Improvement of critical machine lube selection.
Engineering and initial installation of lube support facilities (lube rooms, etc.). Deployment of advanced lube tools needed for improved lube procedures and PMs. Programmatic changes to lubes and lube suppliers as needed.
Greater emphasis on waste reduction, energy conservation, contamination control, safety and environmental issues related to lubricants and lubrication. Emphasis on lubricant consolidation and PM optimization.
Continuous improvement and deployment as lubricants, methods and technologies change. Circular economy emphasis (oil reclamation, reconditioning and reconstruction).
Greater use of lubrication and oil reclamation tasks done "on-condition" using real-time autonomous technologies.
Machine Readiness
Suffering from false economy of buying machines stripped of needed lubrication-related and inspection hardware. No retrofits to remedy inadequate lubrication, contamination control, sampling or inspection devices.
Independent assessment of current machine state benchmarked to the optimum reference state. Opportunities found. Review of engineering specification for hardware needed for new or rebuilt machines. Planning for needed machine modifications.
Purchase and installation of machine modification hardware to enable lubrication contamination control, sampling and inspection improvements.
Emphasis of maintainability and essential machine modifications aligned to ranked failure modes and the optimum reference state.
Related to machine modifications, greater emphasis on waste reduction, energy conservation, contamination control, safety and environmental issues.
Continuous improvement and greater plant-wide deployment as methods and technologies change. Circular economy emphasis. Greater machine-based, smart factory connectivity.
Fully integrated use of autonomous machine integrated technologies with adaptive learning and connectivity.
Metrics & Condition Monitoring
Lack of failure-mode condition monitoring tasks. Outdated task methods, tasks performed poorly and/or tasks performed infrequently. No management metrics related to lubrication or condition monitoring.
Independent assessment of machine inspection, oil analysis and related condition monitoring practices benchmarked to the optimum reference state. Gap analysis. Opportunities found. Assessment of management metrics needs.
Re-engineering of inspection and oil analysis program. Integration with broader condition-based maintenance strategy (proactive and predictive maintenance). Basic initial deployment. Design and roll-out of improved, tactical lubrication-related metrics/KPI's.
Facility-wide deployment of oil analysis, programmatic changes to lab relationship, test slate selection, sample frequency, alarms and limits. Align inspection program to Inspection 2.0 guidelines. Enhanced data collection and analytics.
Enhanced emphasis on proactive maintenance and early fault detection. Installation of on-site lab capabilities, as needed. Addition of mobile sensors and devices to oil analysis and inspection program. Use of mobile, route-based data collection.
Continuous improvement and focus on condition monitoring optimization. Augmented-reality enhanced inspection tools. Use of IIoT wireless sensors and remote monitoring. Focus on data analytics and adaptive machine learning. Expansion of metric/KPI dashboards.
Complete unification of oil analysis and inspection with other condition monitoring technologies, data analytics and A.I. Agile condition control while striving for embedded IIoT and online sensors. Alignment of lubrication and maintenance dashboards with ISO 55001 and enterprise-wide metrics.
Survival
• Crisis and breakdown maintenance.
• High management turnover.
• Pretending to save money by not investing in reliability.
• Entrenched old-school or business-as-usual practices.
Awareness
• Basic management awareness.
• Conscious incompetence.
• Success case study awareness.
• Planning for change.
• Looking for low-hanging fruit.
Crawling
• Low-budget, low-risk changes are implemented.
• Focus on low-hanging fruit.
• Pilot programs.
• Bad actor and mission critical first.
Walking
• Major program expansion initiatives.
• Significant investments in programmatic improvements; training, support facilities, lubricants, tools, machine modification, route-based CMMS, inspection and condition monitoring.
Running
• System-wide deployment of lubrication program transformation plans.
• Stakeholder support to attain lubrication asset management compliance. (ICML 55.1).
• Focus on expanded waste reduction, energy conservation and environmental issues.
Optimizing
• Focus on program optimization initiatives (Optimum Reference State).
• Vision alignment across functional groups, suppliers and customers.
• Greater mission criticality and risk-based initiatives.
• Investments in wireless technologies.
Sustaining
• Sustainability mixed with an aspirational reliability culture.
• Holistic asset management (ISO 55001) integration.
• Corporate, enterprise-wide mandated support and deployment.
• Industry 4.0/5.0 integration.

Navigating the Journey

Facilitators can be onsite professionals or contract service providers

A: Successive scrubbed missions
B: Ready Fire Aim (we can just wing it!)
C: Ready Aim Fire (plan and control approach)

The World Rewards Action

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¡GRACIAS!

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