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SESION

ORGANIZADO POR:
AMGA

CONGRESO DE MANTENIMIENTO & CONFIABILIDAD
★ PERÚ ★

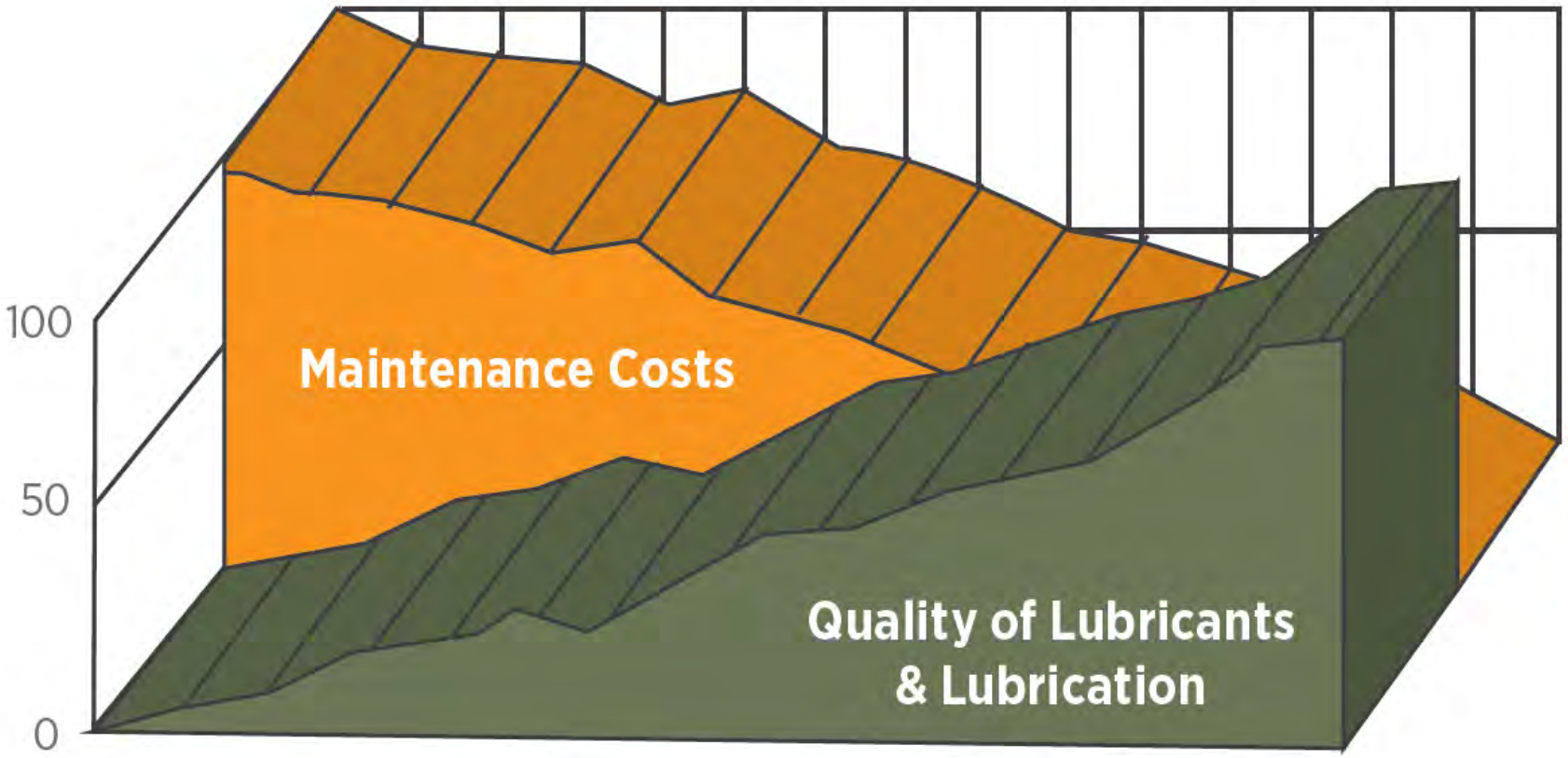
# *The Role of the MLE in Implementing the Landmark Standard ICML 55 Addressing the Lubrication of Mechanical Assets*

**Jim Fitch**
**Noria Corporation**

## 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

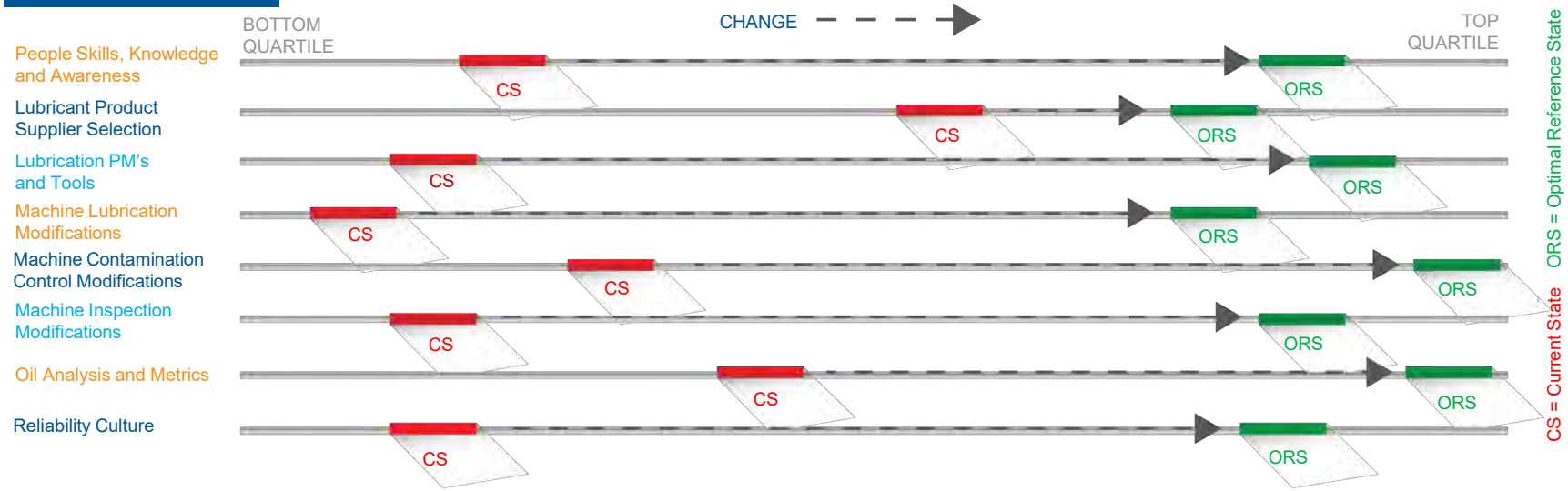
# The Most Common Request

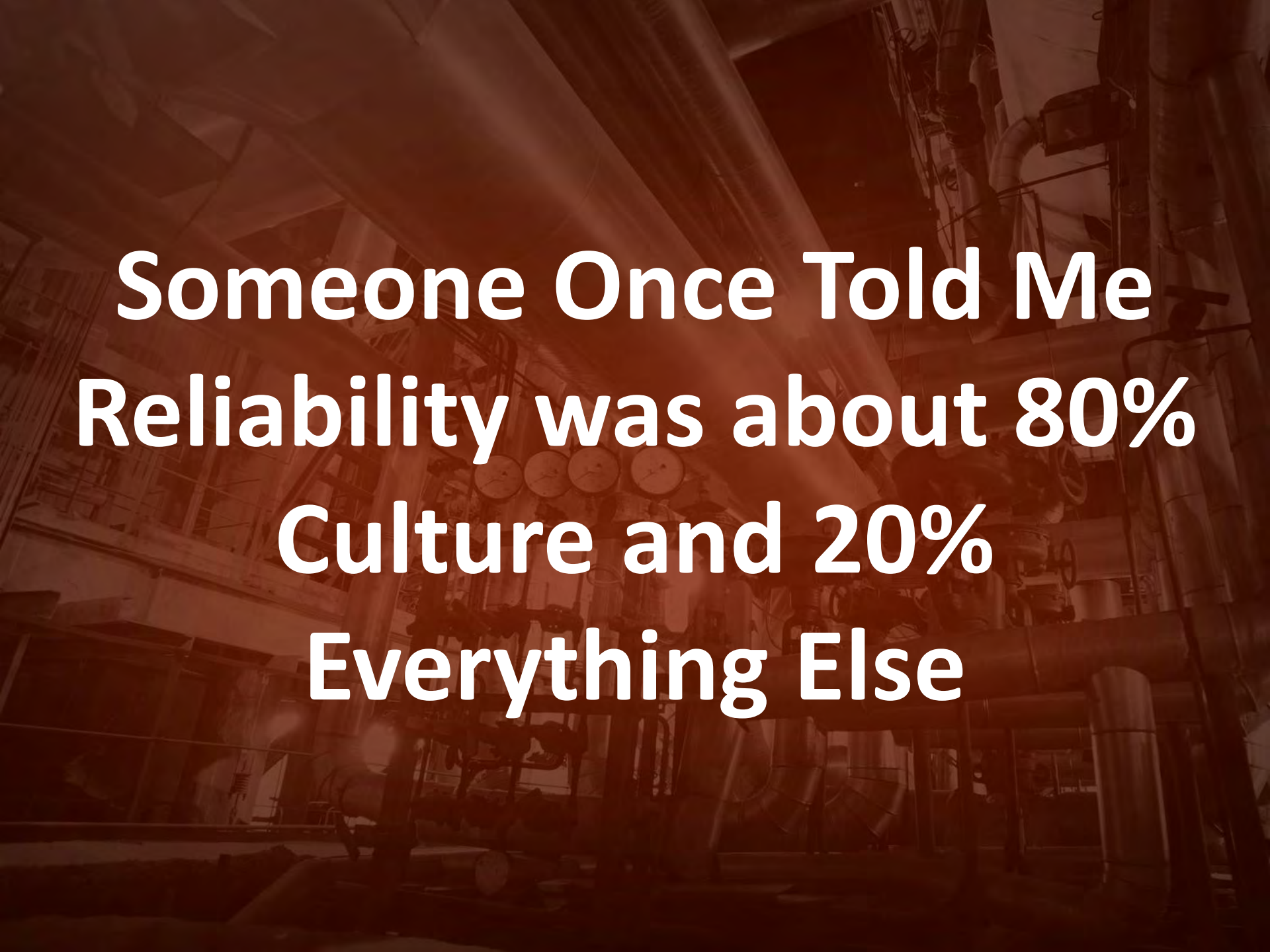



# The Rewards of Action and Change

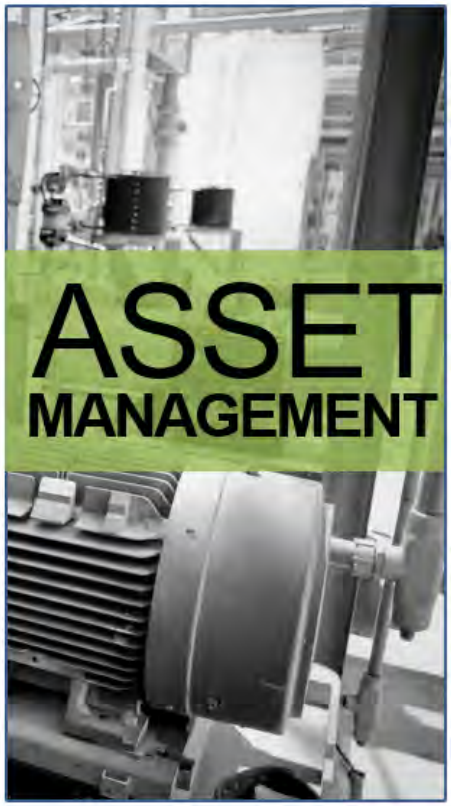
## What You Want


## How You Get It




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

# Definitions




## Asset

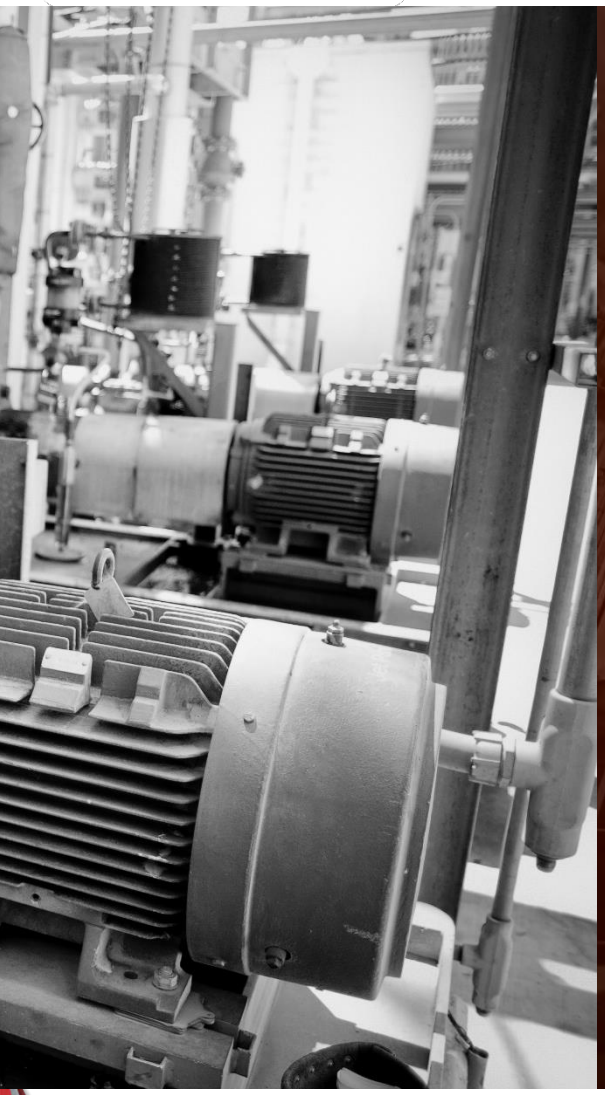
An item, thing or entity that has potential (future), or actual, value to an organization…and can be tangible or intangible, financial or non-financial.

## Asset Management

Involves the balancing of costs, opportunities and risks against the desired performance of assets, to achieve the organizational objectives.

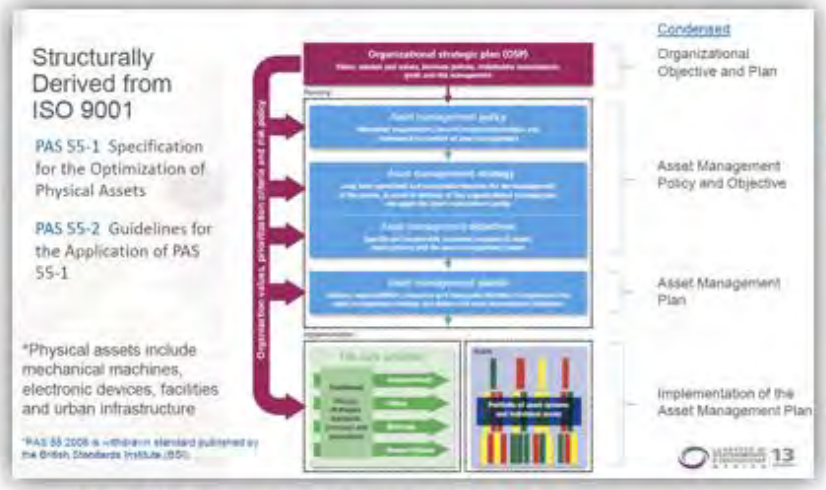
## Asset Management System

A system which provides a structured approach for the development, coordination and control of activities undertaken on assets by the organization over different life cycle stages, and for aligning these activities with its organizational objectives.



# Asset Management is more of a Business Model Revolution than a Technology Revolution

# First there was PAS 55, then came ISO 55000




PAS 55*, British Standards Institute
- Asset Management Standard-

*Withdrawn Standard

(1 Book; 3 Standards)

**ISO 55000, Asset Management**


ISO 55000
Principles and Terms

ISO 55001
Requirements for Certification

ISO 55002
Narrative on How to Achieve Compliance

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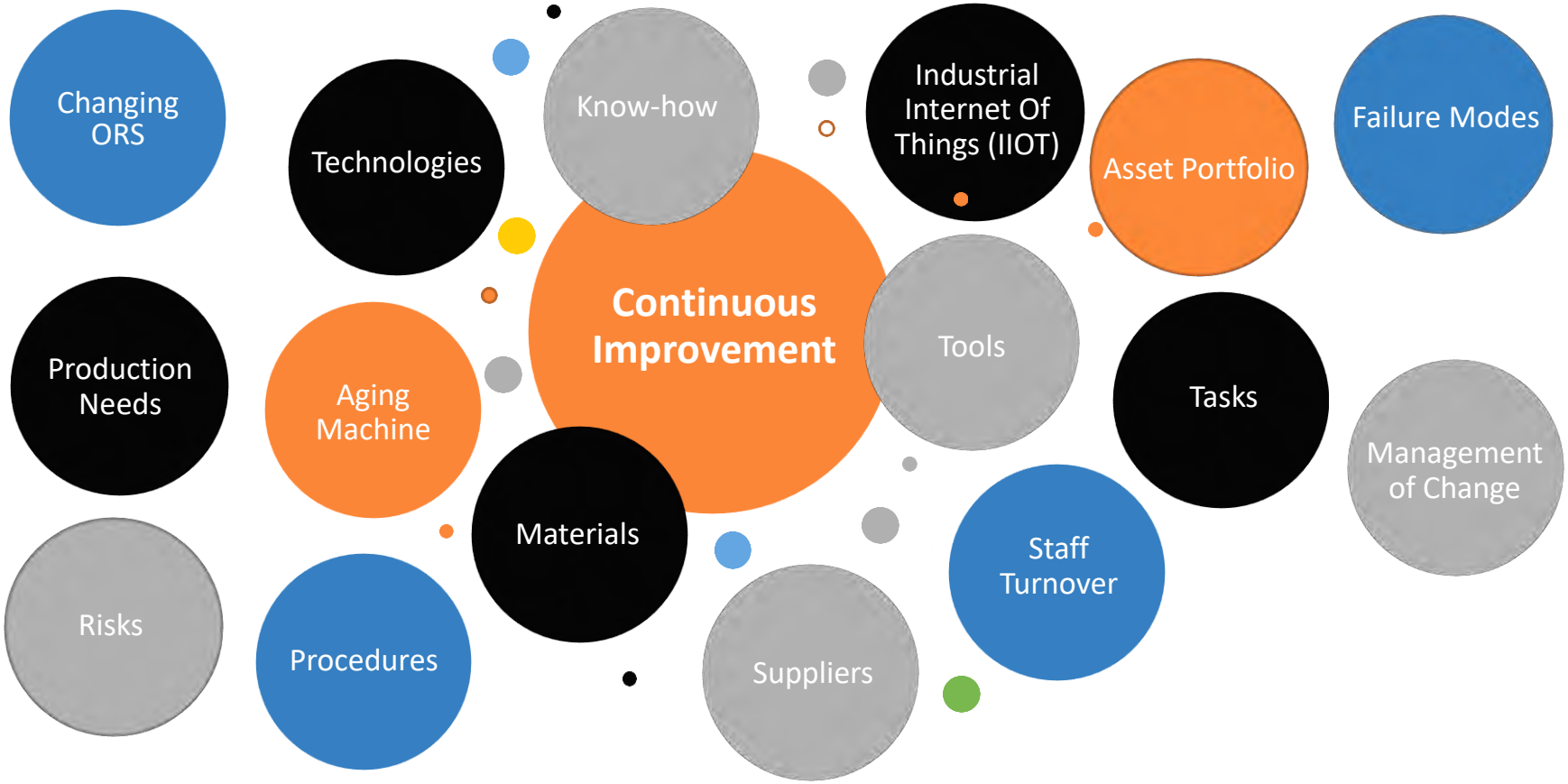
# So Why Should Anyone Care about Asset Management?


Remember that Asset management involves the balancing of costs, opportunities and risks against the desired performance of assets, to achieve the organizational objectives

# Helps Manage Shifting Ground Issues



# ISO 55000

**The GLUE that brings it all together into a single, cohesive purposeful structure**

# The Absence of Asset Management

**Leads to….**

- Confused Priorities
- Organizational Disharmony
- Fiefdoms and Activity Silos
- Flavor-of-the-Month Initiatives
- Disjointed/Fragmented Activities
- Poor Communication
- Pet Projects
- High Management Turnover
- Blame Game
- Tribal Knowledge-based Work

**Results in ….**

- Wasted Resources (People, Energies, Materials, and Products)
- Low OEE (Overall Equipment Effectiveness)
- High Operating and Repair Costs
- Short Machine Service Life (Life Cycle)
- High Cost of Ownership
- Low Return-of-Net-Assets (RONA)
- Hidden Plant (Under Utilized Capacity)

# The Importance of Harmony


**ISO Seeks to Harmonize Structure and Objectives of Companion Standards for Organizations … No Bad Apples … they Propagate**

# Missing Words from PAS 55-1* and ISO 55001

| How frequently do the following words appear in these documents? | PAS 55-1 (REQUIREMENTS) | ISO 55001 (REQUIREMENTS) |
|---|---|---|
| Conditon Monitoring | 3 | 0 |
| Lubrication/Lubricant | 0 | 0 |
| Tribology | 0 | 0 |
| Oil or Grease | 0 | 0 |
| Maintenance | 7 | 1 |
| Inspection | 1 | 0 |
| Reliability/Reliable | 1 | 0 |
| Contamination | 0 | 0 |
| Oil Analysis | 0 | 0 |

*Withdrawn standard

These standards describe big-picture requirements and codification of asset management. A framework. They don't provide a prescriptive game-plan to achieve the Optimal Reference State or specific benchmarks needed for compliance of lubricated mechanical assets. Asset management must be enabled.

# In 2017 the International Council for Machinery Lubrication (ICML) Began the Construction of a New Consensus Standard for Lubricated Mechanical Assets

**The ICML Board Solicited Help From …**

- 46 Subject Matter Experts in Lubrication, Reliability and Asset Management
- 8 ICML Boards Members and Executive Director
- 32 Trainers & Consultants
- 9 Book Authors
- 39 Separate Organizations
- 15 Countries

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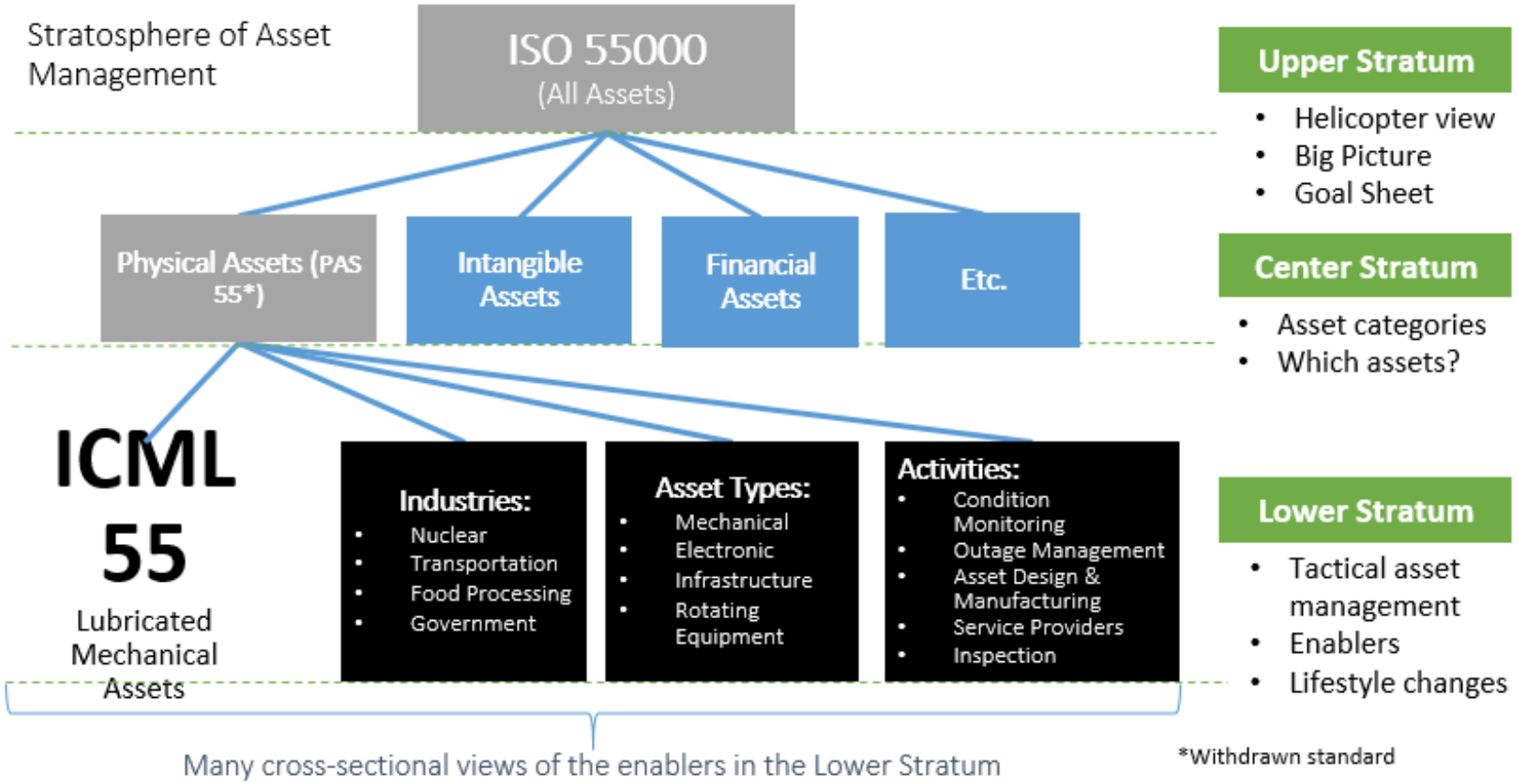
# Game Changer

# Introducing ICML 55…



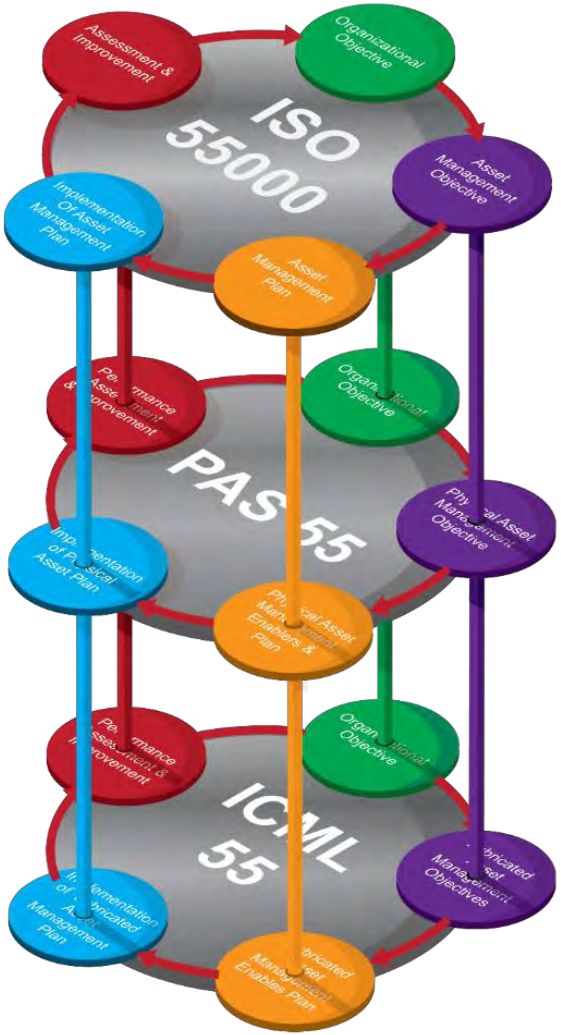

***ISO 55000 is your North Star. ICML 55 commands the ship that gets you there.***

# UNIFICATION—3 Standards; 1 Objective

**Holistic**
All Assets

**Strategic**
Physical Assets

**Tactical**
Lubricated Mechanical Assets



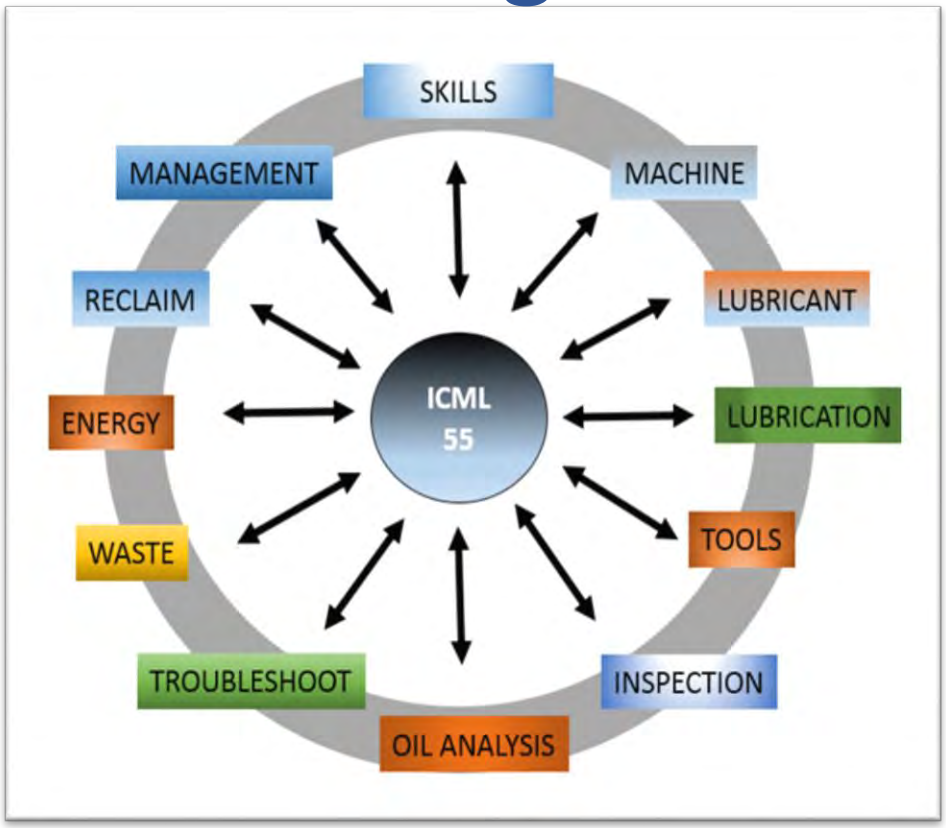

**Role of ICML 55 in the Asset Management Space**

- ICML 55.1 does not replace, complete and technically conflict with ISO 55001
- Instead, it is an enabling standard
- Each clause of ICML 55.1 aligns and supports one or more specific clauses of ISO 55001
- ICML 55.1 delivers a high degree of specificity (detail) at a tactical level for lubricated mechanical assets

# Care Of Each Tree

# The Big 12

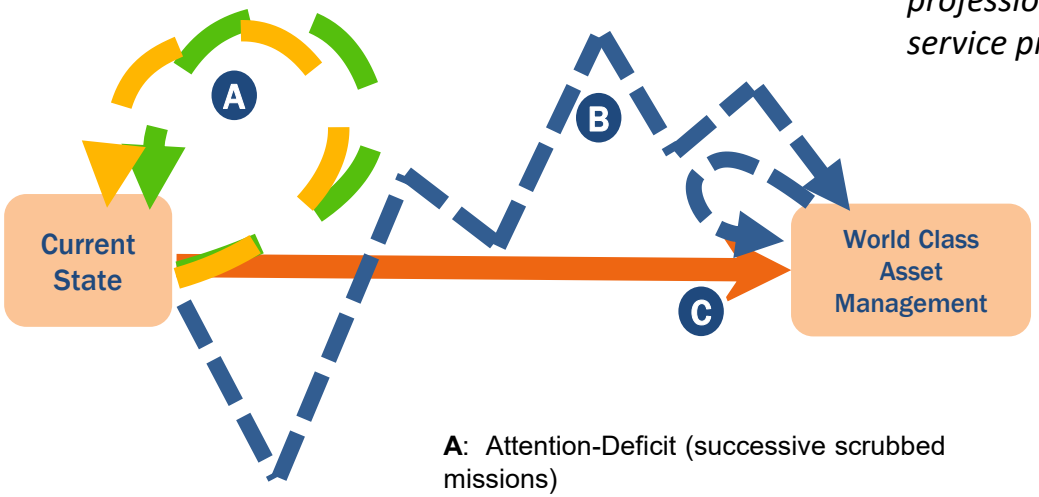
| | | |
|---|---|---|
| 01 | SKILLS | JOB TASK, TRAINING, AND COMPETENCY |
| 02 | MACHINE | MACHINE LUBRICATION AND CONDITION MONITORING READINESS |
| 03 | LUBRICANT | LUBRICANT SYSTEM DESIGN AND SELECTION |
| 04 | LUBRICATION | PLANNED AND CORRECTIVE MAINTENANCE TASKS |
| 05 | TOOLS | LUBRICATION SUPPORT FACILITIES AND TOOLS |
| 06 | INSPECTION | MACHINE AND LUBRICANT INSPECTION |
| 07 | LUBRICANT ANALYSIS | CONDITION MONITORING AND LUBRICATION ANALYSIS |
| 08 | TROUBLESHOOTING | FAULT/FAILURE TROUBLESHOOTING AND RCA |
| 09 | WASTE | LUBRICANT WASTE HANDLING AND MANAGEMENT |
| 10 | ENERGY | ENERGY CONSERVATION AND ENVIRONMENTAL IMPACT |
| 11 | RECLAIM | OIL RECLAMATION AND SYSTEM DECONTAMINATION |
| 12 | MANAGEMENT | PROGRAM MANAGEMENT AND METRICS |




**Do Not Think Nothing Has Changed!**

# Someone Has to Help Facilitate and Navigate the Transformation

*Facilitators can be onsite professionals or contract service providers*




**A**: Attention-Deficit (successive scrubbed missions)
**B**: Ready Fire Aim (we can just wing it!)
**C**: Ready Aim Fire (plan and control approach)

*Knowing is not the same thing as doing*

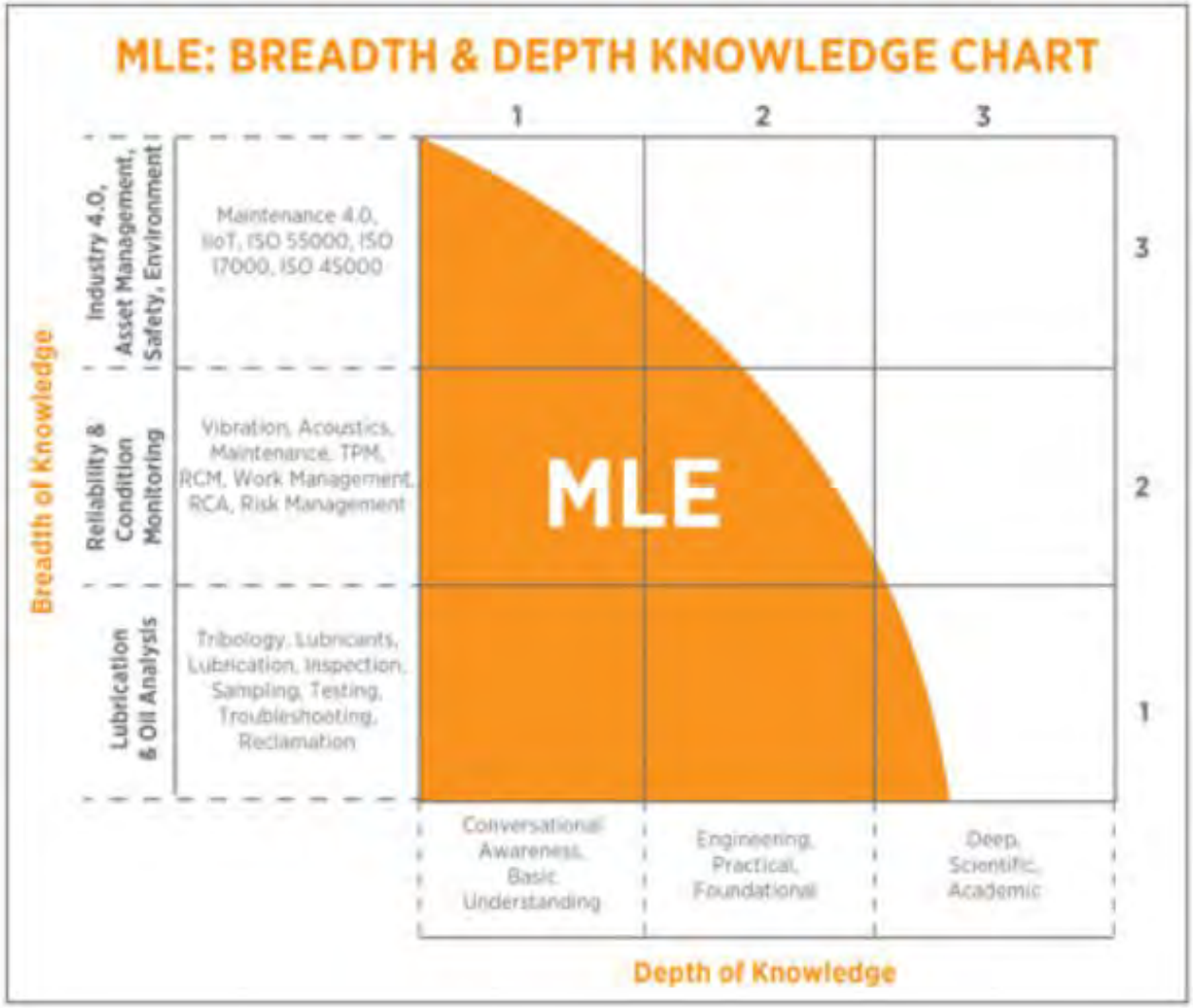

LUBRICATION ENGINEER
MLE
CML CERTIFIED
TM

# ICML

International Council for Machinery Lubrication

- **World's largest testing body in Lubrication and Oil Analysis**
- **Over 20,000 certified**
- **ISO 18436 compliance**
- **Available certifications:**
  - Machine Lubricant Analyst I, II & III
  - Machine Lubrication Technician I & II
  - Laboratory Lubricant Analyst I, II, & III
  - Machinery Lubrication Engineer (Apr-2018)
- **Awards for excellence in Plant Lubrication and Oil Analysis**

# ICML 55—MLE Alignment




# The Jobs of an MLE

- Selection of Lubricants
- Selection of Lubrication Equipment
- Selection of Contamination Control Products
- Management of Lubrication Suppliers and Service Providers
- Lubrication and Inspection PMs and Work Order Management
- Writes Lubrication Procedures to Be Consistent with Best Practice
- Lubricant Handling, Storage, Consumption and Conservation
- Develops Lubrication-related Engineering Specifications for New Machinery
- Warranty and Regulatory Compliance Management
- Manpower Planning, Administration, Staff Training and Certification
- Lubrication Information Management
- Oil Analysis Program Design and Coordination
- Failure Modes and Effects Analysis (FMEA); Failure Reporting, Analysis and Corrective Action System
- Management Reporting and Performance Metrics


# MLE-enabled Self-funded Transformation

| OPERATING & MAINTENANCE SAVINGS | INITIAL INVESTMENT (NON-RECURRING) | ANNUAL SAVINGS | 1ST YEAR RETURN ON INVESTMENT | 2ND YEAR & BEYOND |
|---|---|---|---|---|
| Reducing Your Fuel and Energy Bill | $30 | $30 | 0 | $30 |
| Reducing Your Lubricant Spend | $20 | $10 | $10 | $10 |
| Reducing Spend on Contamination Control | $20 | $10 | $10 | $10 |
| Precision PMs, Fewer Work Orders | $10 | $30 | ($20) | $30 |
| Unifying Condi-tion Monitoring with Inspection | $20 | $20 | 0 | $20 |
| Total | $100 | $100 | 0 | $100 |
| Annual Savings from Downtime Reduction | | $50 | $50 | $400+ |
| Total Return | | $150 | $50 | $450+ |

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# Getting Lubricant Selection Right

Lubricants are what we buy.  Lubrication is what we do

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# 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

# 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** |

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# 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

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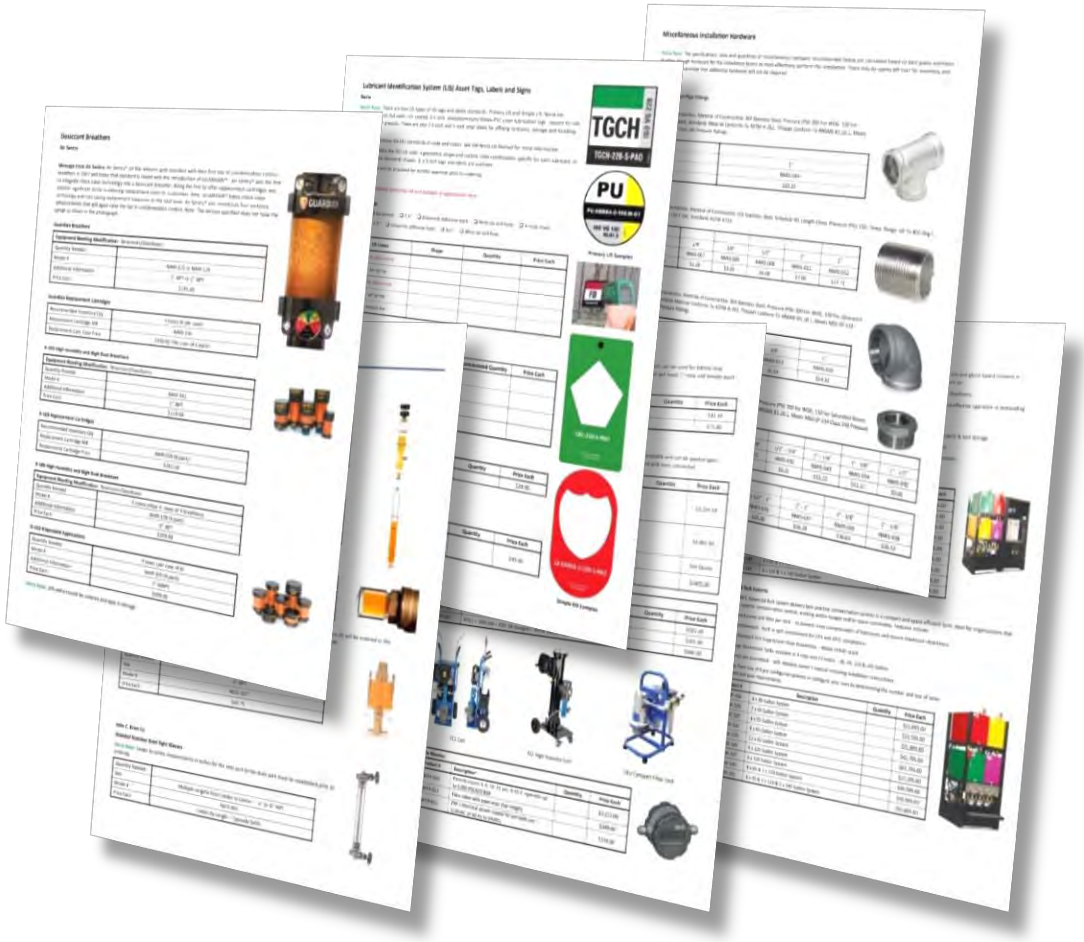
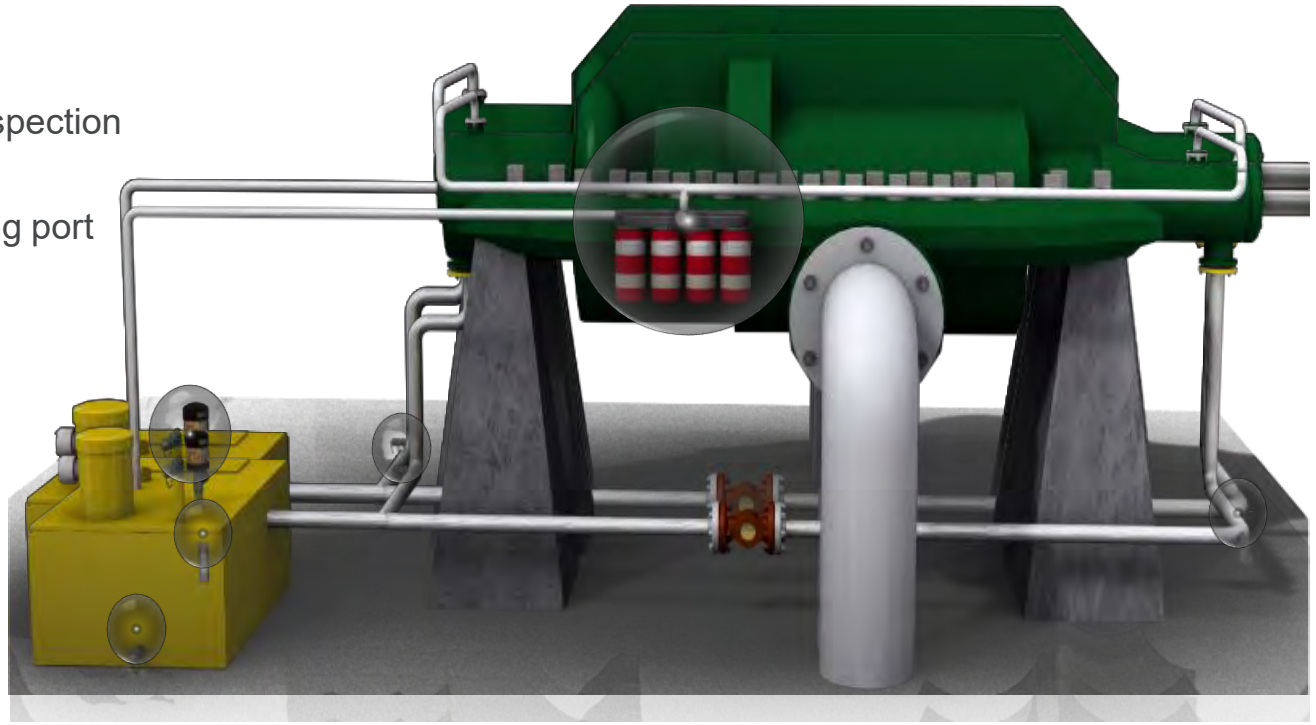
# Procedures Define the Optimized Use of Tasks, Skills, Tools and Methods

- Storage and Handling
- Inspection
- Lubrication
- Contamination Control

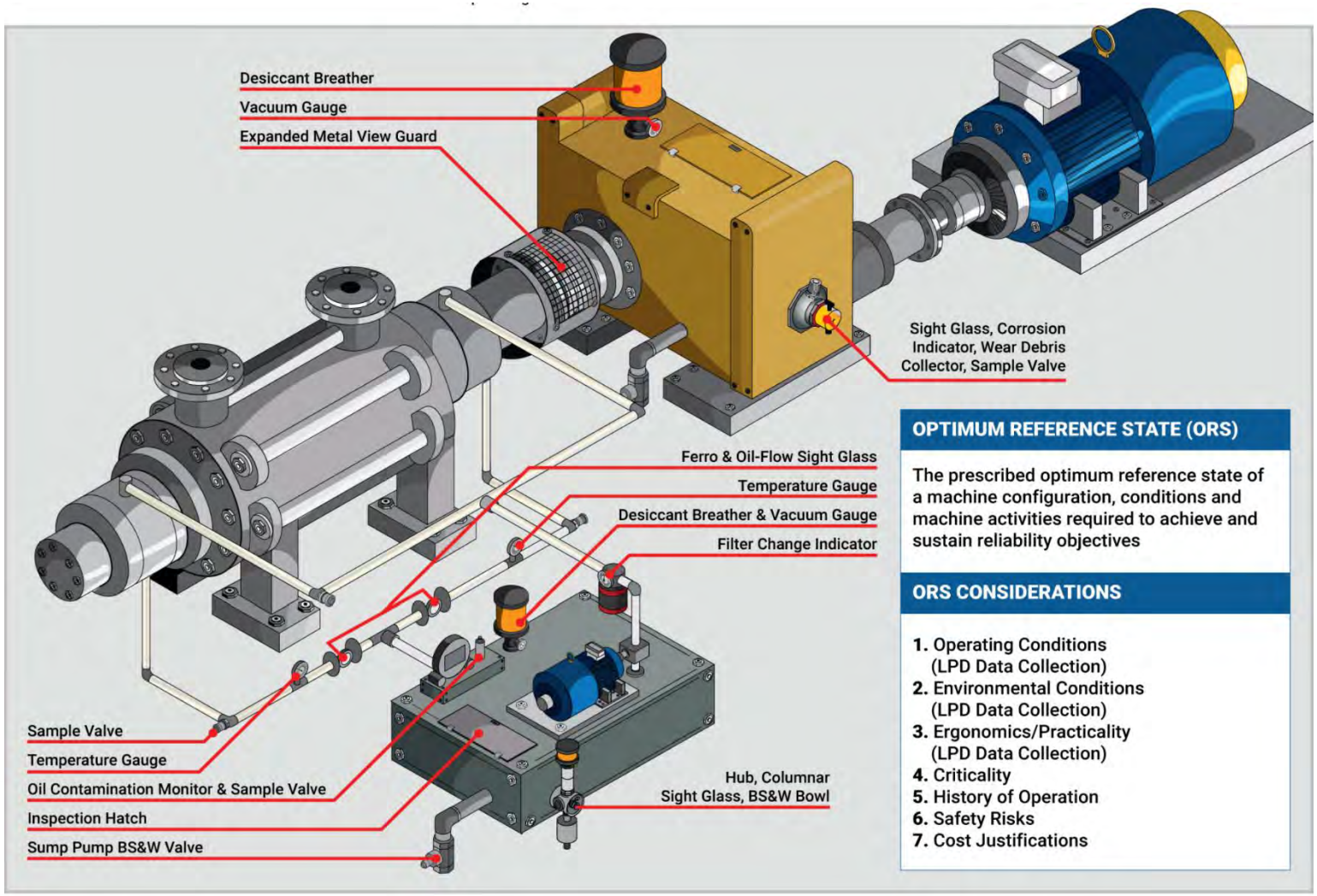


# Getting Machine Modifications Right

- Breather
- Oil fill port
- Oil change
- Oil level inspection
- Filtration
- Oil sampling port



# ICML 55 Machine 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

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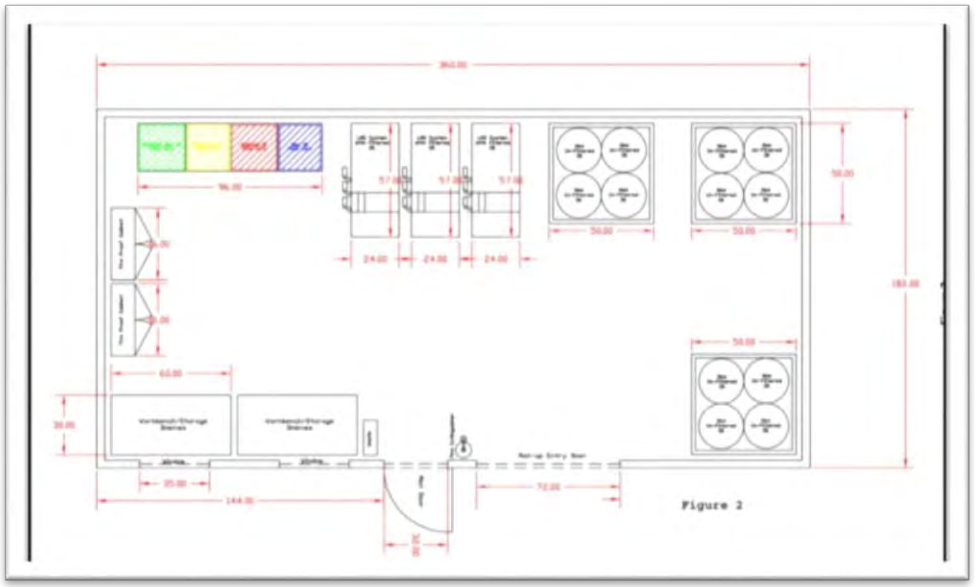
# The Lube Room is the Centerpiece of your Lubrication Program



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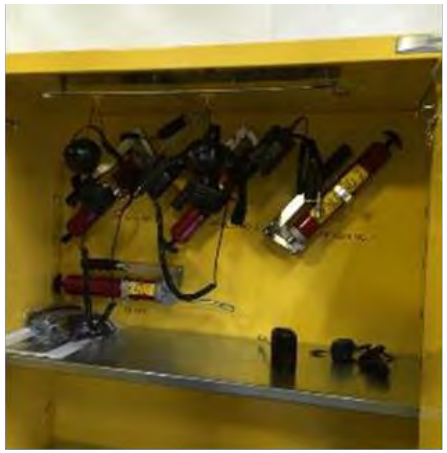
HIAC PODS+
PODS+



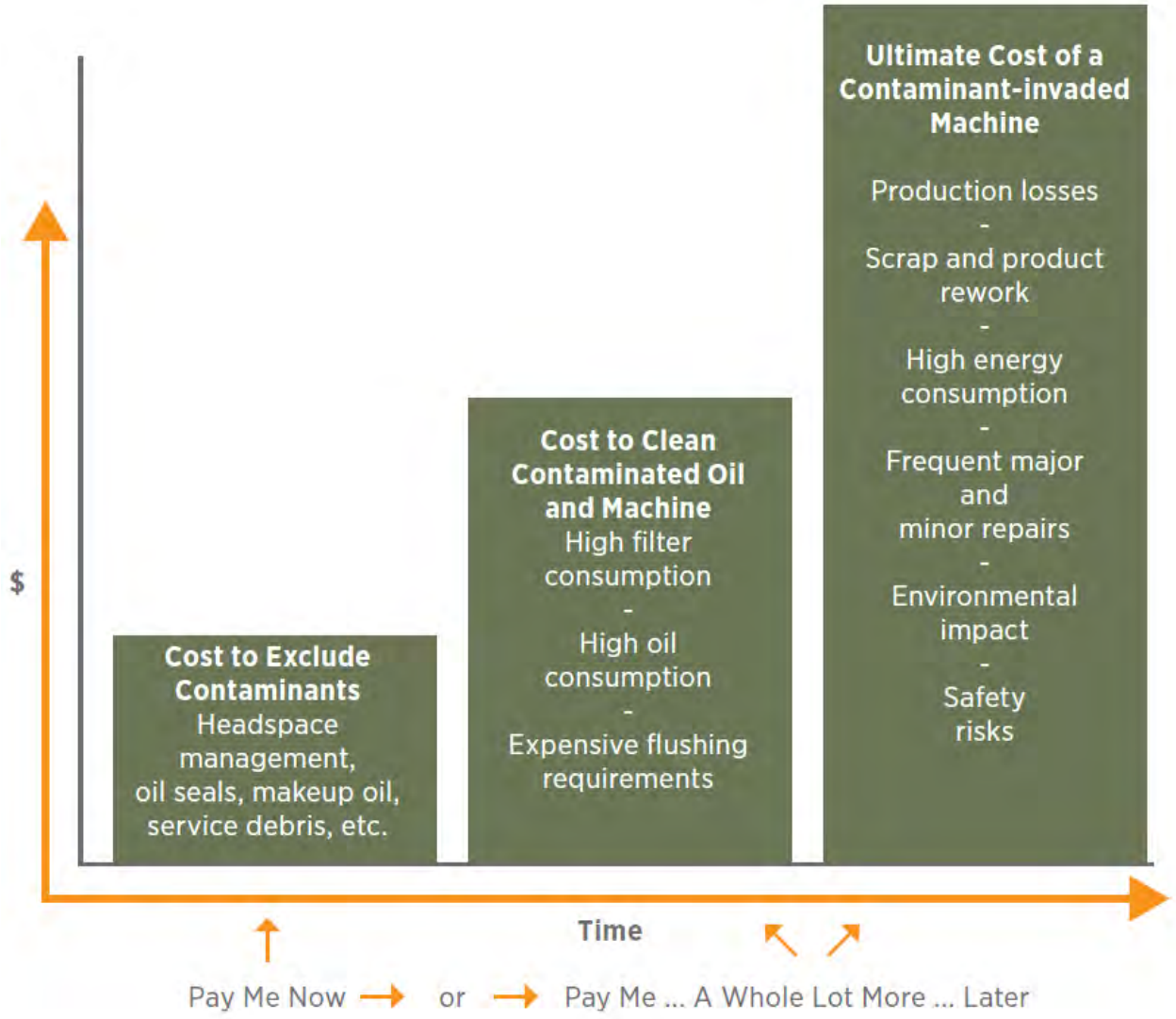

REMOVE
BEFORE U


OilSafe


OIL SAFE CONTAINERS

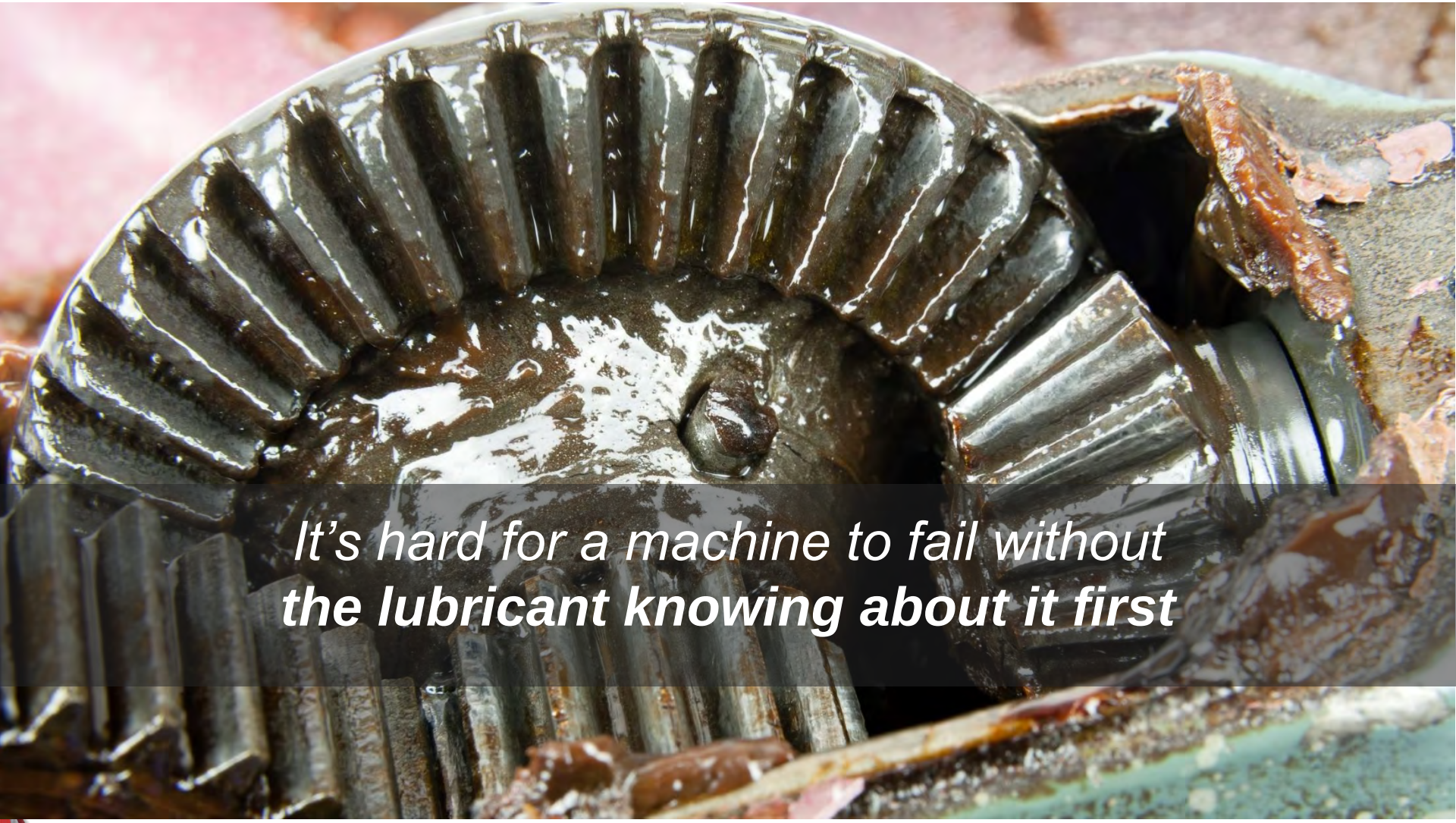

HANDY
LATEX

# Getting the Waste Out of Contamination Control


# Metrics and Oil Analysis

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


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

Your Oil is Talking…

But are You Listening?


# 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 |

# Machines Fail and Waste Occurs

## Because of What People Do… and What They Don't Do


# Inspection Skills and the Power of Observation

- 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?

# What Should You do Immediately if You Saw This?



# *Don't Assume They Already Know*


# Task-Based Training

***The What***

***The How***

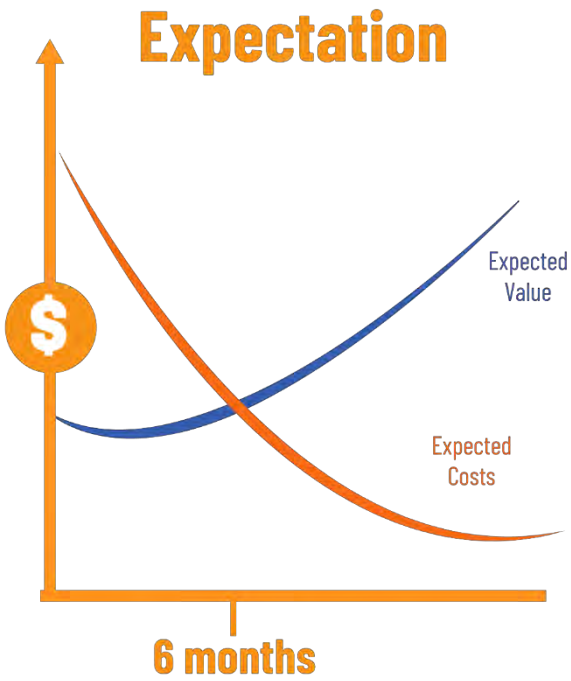
***The Why***

***The When***

***The Where***

***Operators, Millwrights, Trades***

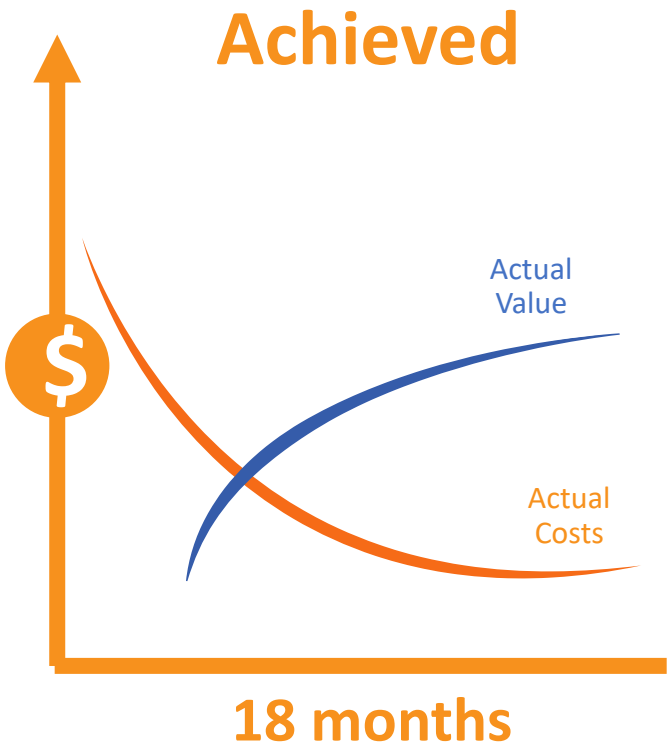

# Let's Talk About Sustainability



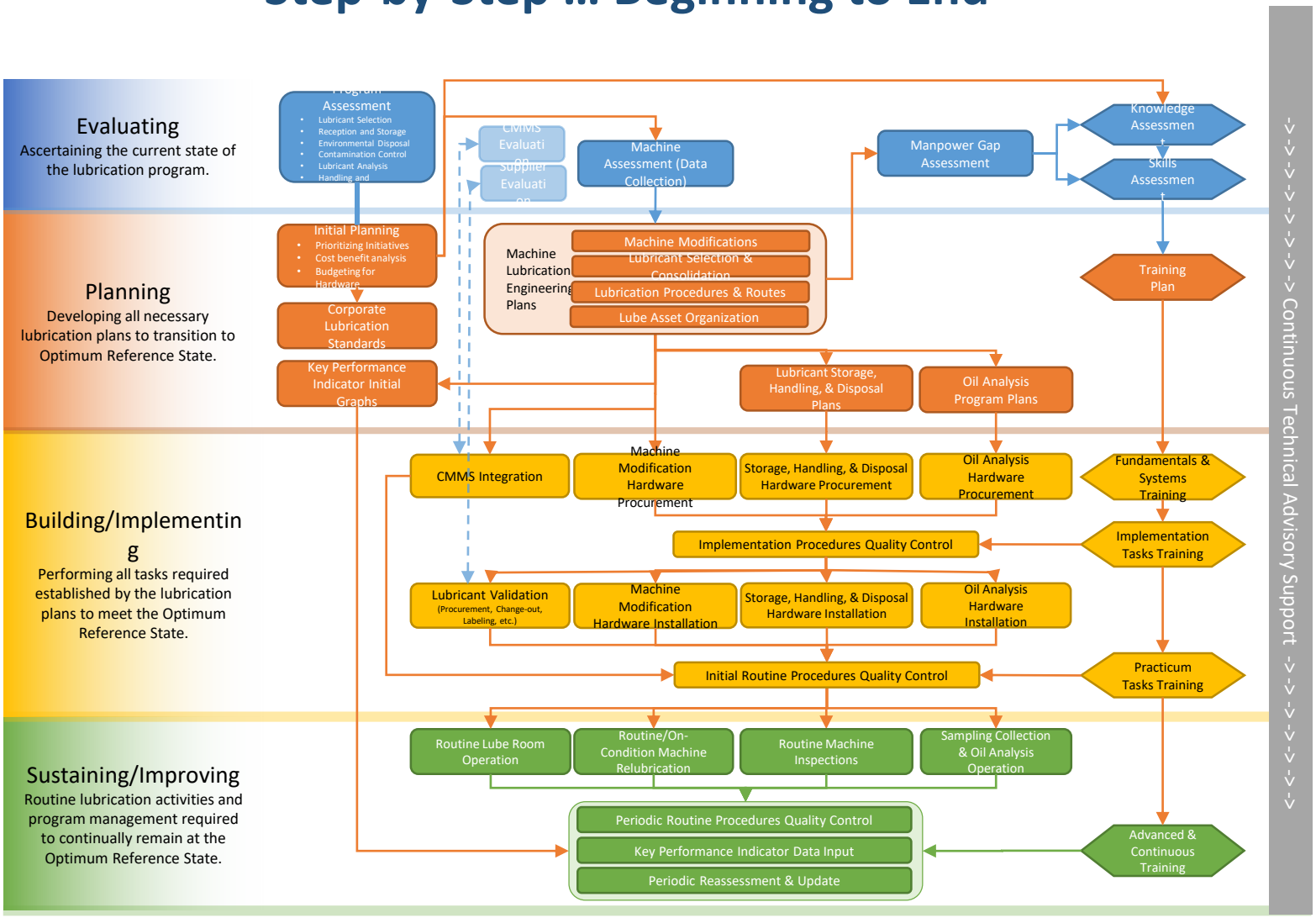


# Agents of Sustainability

- Training and certification of trade
- Standardized work
- Management-of-change
- Audits and re-assessments
- Measurement: KPI, metrics, etc.
- Aligned goals, policies & objectives
- Peer pressure



# What an ICML 55 Transformation Looks Like Step-by-Step … Beginning to End

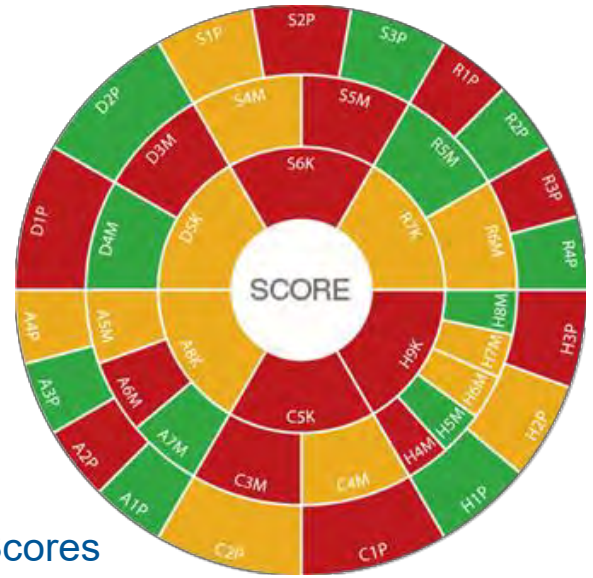


# Maturity Progress is Scaled, Scored and Monitored

## Management Levels


## Program Stages


## Elements




## Elements Scores


# Critical Work Elements in the Transformation

**Selection (S)**

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

**Lubricant Analysis (A)**

A1P Machinery Selection for Lubricant Analysis Program
A2P Test Slate Selection
A3P Lubricant Laboratory Selection
A4P Sampling
A5M Limits Selection for Lubricant Analysis
A6M Lubricant Analysis Interpretation
A7M Lubricant Analysis Training
A8K Lubricant Analysis KPIs

**Reception and Storage (R)**

R1P Lubricant Storage
R2P Lube Room
R3P Quality Control Process
R4P Safety Practices
R5M Inventory Management
R6M Reception and Storage Training
R7K Reception and Storage KPIs

**Contamination Control (C)**

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

**Handling and Application (H)**

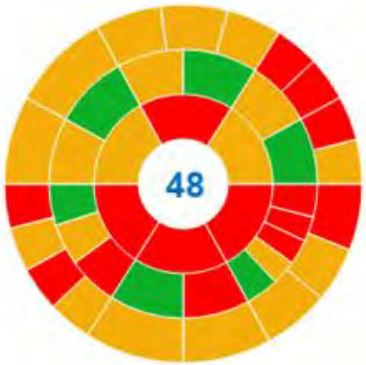
H1P Lubricant Application Tasks
H2P Machinery Configuration
H3P Handling and Application Devices
H4P Lubrication Program Management
H5M Lubrication Routes
H6M Machinery Inspection Devices and Practices
H7M Goals and Rewards System
H8M Management and Application Training
H9K Handling and Application KPIs

**Environmental Disposal (D)**

D1P Storage and Disposal of Used Oil
D2P Storage and Disposal of Material Contaminated with Oil
D3M Leak Management
D4M Environmental Disposal Training
D5K Environmental Disposal KPIs


# Dashboard


Current




Standards Manual & Training


Engineering Design &
Lube Storage and Handling


Implementation

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# Total and Compete Execution


**Lubrication Program Manager**
For LPM2 Test Plant

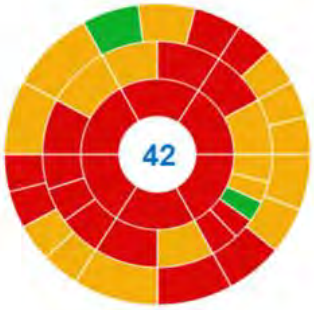
- Home
- LPD
- Data
- Metrics
- User Options
- Log Out

Logged in as Bennett F.

Engineered by Noria

## Lubrication Program Development Overview


Initial Launch Assessment Score
Completed: 8/26/2019




Current Score
As of: 9/2/2019

- <30 Deficient Implementation
- ≥30 - <90 Basic Implementation
- ≥90 Implemented

CHART EXPLANATION>>

Suggested Progression Model Through Eight Initative Groups

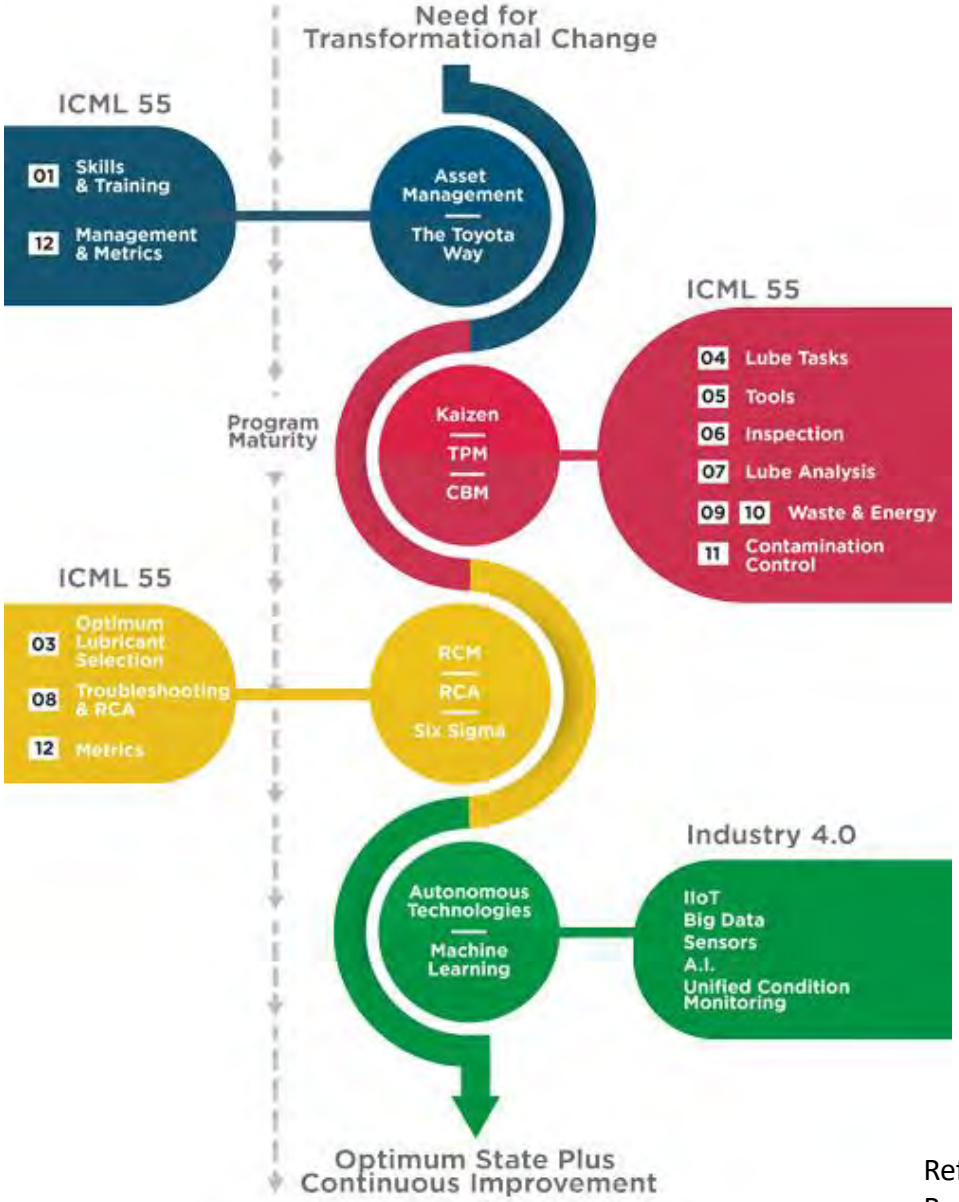

| Engineering Phase | Lubrication Standards | Storage & Handling Dev | Lubrication Training | Hardware Modifications | Lubrication Routes | Oil Analysis | Management & KPIs |
|---|---|---|---|---|---|---|---|
| Completed: 9/2/2019 | Incomplete | Incomplete | Incomplete | Incomplete | Incomplete | Incomplete | Incomplete |

| Initiative Groups | Current Progress | Date Completed | Score Improvement | Projected Score* |
|---|---|---|---|---|
| Engineering Phase | 100% (99/99) | 9/2/2019 | +23 | 42 |
| Lubrication Standards | 5% (2/40) | Incomplete | +10 | 52 |
| Storage & Handling Dev | 35% (29/84) | Incomplete | +11 | 63 |
| Lubrication Training | 33% (18/55) | Incomplete | +10 | 73 |
| Hardware Modifications | 24% (17/72) | Incomplete | +11 | 84 |
| Lubrication Routes | 77% (24/31) | Incomplete | +1 | 85 |
| Oil Analysis | 48% (15/31) | Incomplete | +7 | 92 |
| Management & KPIs | 45% (69/154) | Incomplete | +6 | 98 |

*Projected scored is based on following the suggested progression model

BRÚJULA SESION

# The Transformation Journey




Ref. What Tool? When?
Ron Moore

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# *Thank You*