

# La confiabilidad dirigida por los operadores de producción

## ODR – Operator Driven Reliability



Gilberto M. B. Serrano  
Gilberto.Serrano@skf.com



# SKF - Tecnología y servicios



**Bearings and units**



**Seals**



**Lubrication systems**



**Mechatronics**

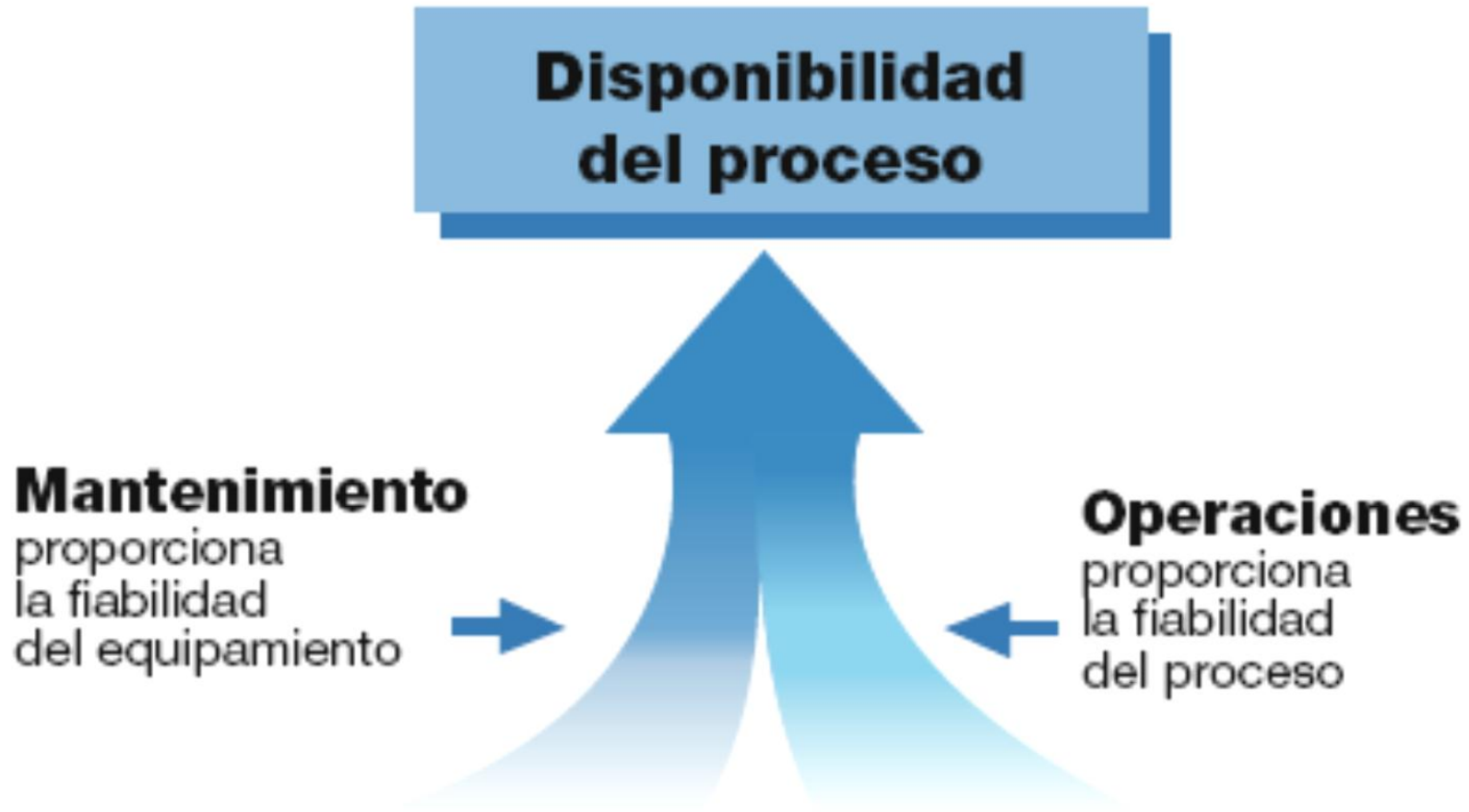


**Services**



- ✓ Garantizar la seguridad de sus empleados.
- ✓ Reducir costes de producción.
- ✓ Ser competitivos a nivel nacional/ mundial.
- ✓ Garantizar la alta calidad de sus productos.





- ✓ ODR es un proceso basado en trabajo en equipo que busca optimizar la operación de un planta industrial en base a la mayor involucración en la fiabilidad de la planta de los operarios de producción.
- ✓ ODR impacta en la efectividad de los equipos, contribuyendo a obtener una óptima producción y retorno de la inversión.





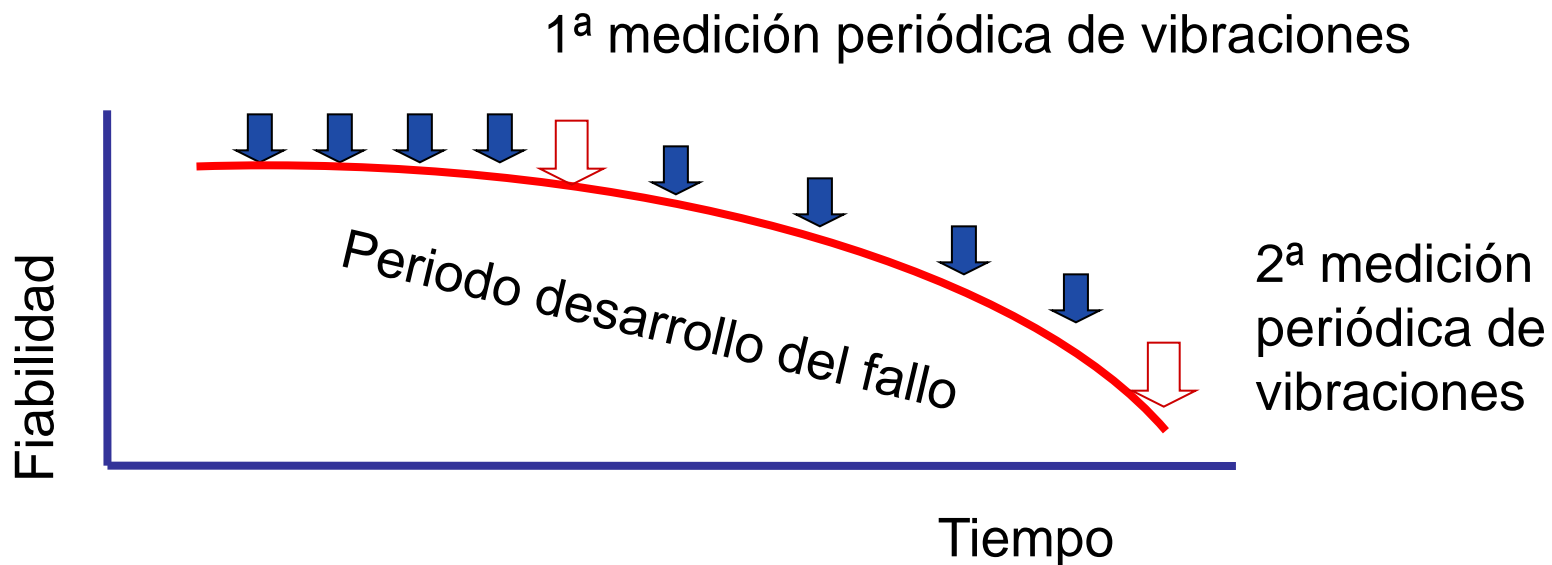
Tendencias  
Parámetros  
proceso

Rutas de  
Inspección con  
Acciones correctoras

Tendencias  
Vibración,  
Temp. etc..



# Operadores vs condición de la maquinaria



La aportación de los operarios es crucial!

## Tareas para el operador

- ✓ Inspecciones visuales (niveles, fugas, funcionamiento anormal, presión, etc..)
- ✓ Monitorización de la condición. (temperatura, vibración, etc.)
- ✓ Preventivo básico (monitorizar la calidad, rutinas de limpieza, comprobaciones de seguridad, etc)
- ✓ Automatización de información (Informes y checklists varios.)





## Maintenance Daily Mill Watch Check Sheet

Date: 6-11-2002

Maintenance Man: P. Portler

Foreman: \_\_\_\_\_

### Walk through tunnels from Furnace to Cooling Bed Once per shift

#### Furnace:

Hydraulic System Level Full  
 Temperature EAST 420 / WEST 520  
 Filter Press. IN @ 4 bar / OUT 2 bar  
 System Pressure 300  
 Grease System Leaks OK  
 Normal YES  
 Barrel Level OK  
 Fan Oiler OK  
 Bearing Temp. OK  
 Carry Over Chain Cables OK  
 Dogs OK  
 Roll Line (List Location) OK  
 Sump Pumps OK  
 General Operation OK  
 Leaks, Noise, etc. OK

#### Reversing Mill:

Hydraulic System Level Full  
 Temperature 1100  
 Leaks YES  
 Pressure 1900 Ps!  
 Grease System OK  
 Barrel Level OK  
 Normal OK  
 Lube System Level 5 fl. oz.  
 Temperature 90  
 Filter Pressure IN 4 1/2 / OUT 3 bar

### Continuous Mill Lube Systems:

Stand #1 Level 3N/14  
 Stand #2 Level Full  
 Stand #3 Level Full  
 Stand #4 Level Full  
 Stand #5 Level 3N/14  
 Stand #6 Level 3N/14  
 Stand #1 Temperature 420  
 Stand #2 Temperature 440  
 Stand #3 Temperature 440  
 Stand #4 Temperature 460  
 Stand #5 Temperature 460  
 Stand #6 Temperature 460  
 Stand #1 Pressure IN 4 1/2 OUT 3 bar  
 Stand #2 Pressure IN 5 OUT 3 1/2 bar  
 Stand #3 Pressure IN 5 OUT 3 1/2 bar  
 Stand #4 Pressure IN 4 1/2 OUT 3 bar  
 Stand #5 Pressure IN 4 OUT 3 1/2 bar  
 Stand #6 Pressure IN 4 OUT 3 1/2 bar

### Continuous Mill Hydraulic System:

Temperature 420  
 Level Full  
 System Pressure 2000 Ps!  
 Leaks YES  
 Roll Line Water Cooling OK  
 List Problem Area ✓  
 General Operations OK  
 Leaks, Noise OK

### Cooling Bed:

West Kick Off Dogs OK  
 Operation OK  
 East Kick Off Dogs OK  
 Operation OK  
 Roll Line Water Flow OK  
 Grease System Leaks ✓  
 Carry Off Chains OK  
 List Location ✓

### Straightening Machine:

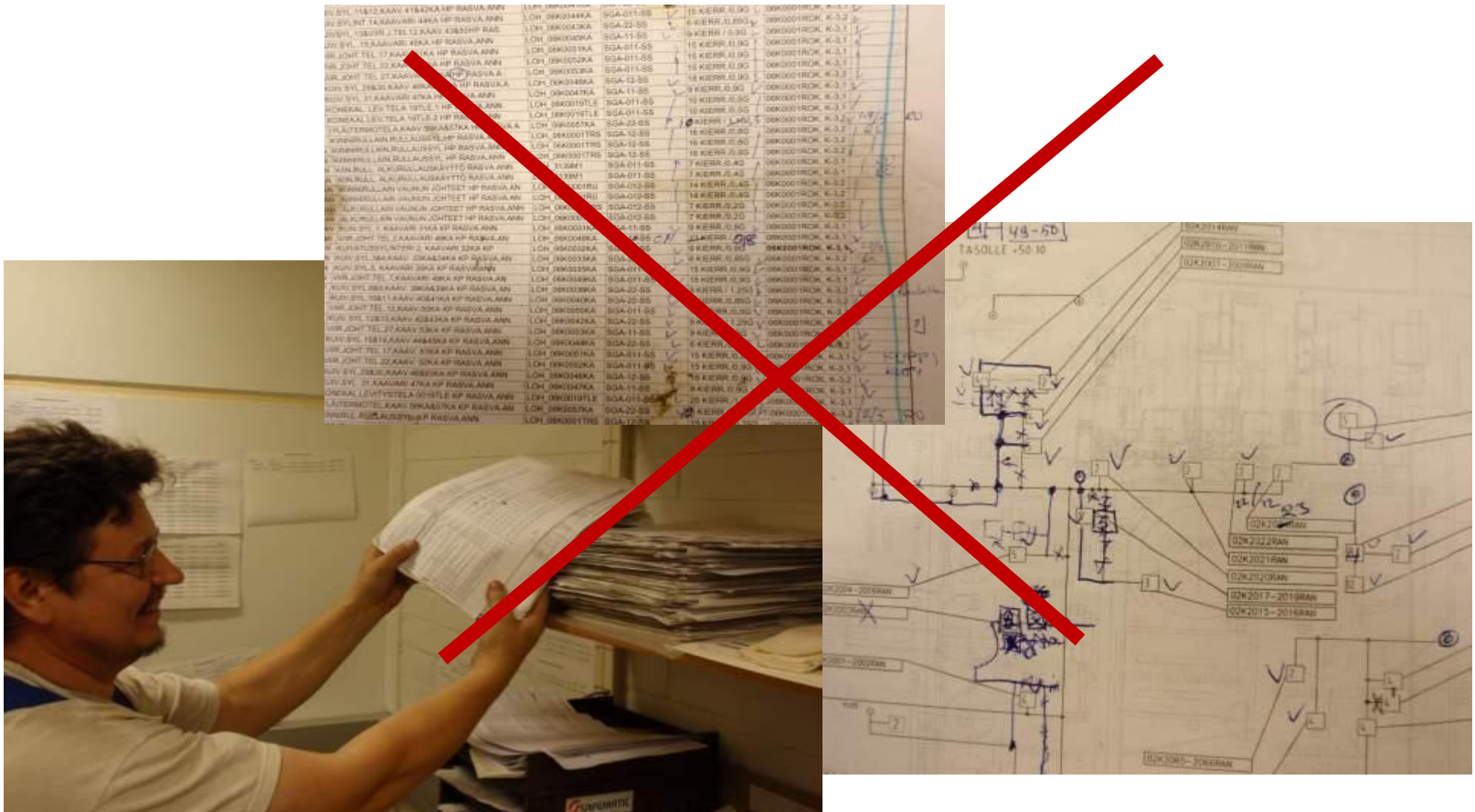
Lube System Level Full  
 Temperature 360  
 Filter Pressure IN 6 OUT 5 1/2 bar  
 System Pressure OK  
 Kick Off Chain System OK  
 Carry Over Chain System OK  
 Run out Roll Line OK

### Cold Saw:

East Disappearing Stop OK  
 West Disappearing Stop OK  
 Roll Line OK  
 Hydraulic System Level Full  
 Temperature 250  
 System Pressure 1000 Ps!  
 Leaks YES  
 Lube Oil System Level 3 fl. oz.  
 Temperature 940

Aunque lo hagan mal, a menudo se recogen datos que proporcionan poco o nada de valor

# Como NO guardar la información





# Fiabilidad en la información



## Maintenance Daily Mill Watch Check Sheet

Date: 6-11-2012 Maintenance Man: P. Porter Foreman: \_\_\_\_\_

Walk through tunnels from Furnace to Cooling Bed  
Once per shift

**Furnace:**  
 Hydraulic System Level Full  
 Temperature EAT 420 / WST 520  
 Filter Press IN 0.4 bar / OUT 2 bar  
 System Pressure 2000 PSI  
 Leaks 110-220 MM SW FISHING  
 Grease System Leaks YES  
 Normal YES  
 Barrel Level OK  
 Combustion Air OK  
 Fan Oiler OK  
 Bearing Temp. OK  
 Unusual Noise NO  
 Charging Grid Cables OK  
 Dogs OK  
 Roll Line (List Location) OK  
 Sump Pumps OK  
 General Operation OK  
 Leaks, Noise, etc. OK

**Continuous Mill Lube Systems:**  
 Stand #1 Level Full  
 Stand #2 Level Full  
 Stand #3 Level Full  
 Stand #4 Level Full  
 Stand #5 Level Full  
 Stand #6 Level Full  
 Stand #1 Temperature 42°C  
 Stand #2 Temperature 44°C  
 Stand #3 Temperature 44°C  
 Stand #4 Temperature 46°C  
 Stand #5 Temperature 46°C  
 Stand #6 Temperature 46°C  
 Stand #1 Pressure IN 4.2 OUT 3.5 bar  
 Stand #2 Pressure IN 5.0 OUT 3.6 bar  
 Stand #3 Pressure IN 5.0 OUT 3.6 bar  
 Stand #4 Pressure IN 4.2 OUT 3.5 bar  
 Stand #5 Pressure IN 4.2 OUT 3.5 bar  
 Stand #6 Pressure IN 4.2 OUT 3.5 bar

**Continuous Mill Hydraulic System:**  
 Temperature 42°C  
 Level Full  
 System Pressure 2000 PSI  
 Leaks YES  
 Roll Line Water Cooling OK  
 List Problem Area OK  
 General Operations OK  
 Leaks, Noise OK

**Cooling Bed:**  
 West Kick Off Dogs OK  
 Operation OK  
 East Kick Off Dogs OK  
 Operation OK  
 Roll Line Water Flow OK  
 Grease System Leaks OK  
 Normal OK  
 Barrel Level OK  
 Carry Off Chains OK  
 List Location OK  
 Straightening Machine:  
 Lube System Level Full  
 Temperature 36°C  
 Filter Pressure IN 6.0 bar  
 System Pressure OK  
 Kick Off Chain System OK  
 Carry Over Chain System OK  
 Run out Roll Line OK

**Cold Saw:**  
 East Disappearing Stop OK  
 West Disappearing Stop OK  
 Roll Line OK  
 Hydraulic System Level Full  
 Temperature 25°C  
 System Pressure 1000 PSI  
 Leaks YES  
 Lube Oil System Level Full  
 Temperature 94°C

The screenshot shows the SKF @pitude Analyst software interface. The main window displays a hierarchical tree of equipment components for 'TOWER #1'. The components listed include: TOWER FOUNDATION, CONCRETE BASE, FOUNDATION BOLTS (1), FOUNDATION BOLTS (2), SURROUNDING SOIL, GROUNDING CONNECTS, CLEANLINESS (1), CLEANLINESS (2), FOUNDATION DRAIN, MAIN CONTROLLER, CONSOLE MOUNTING (1), CONSOLE MOUNTING (2), CABINET CONDITION, CABINET DOORS, CLIMATE CONTROL, GROUNDING CONNECTS, WIRING CONNECTS (1), WIRING CONNECTS (2), COMPUTER, TURBINE UPS, INTAKE / EXH FILTERS, CAB CLEANLINESS (1), CAB CLEANLINESS (2), LV DIST PANEL, SSG CONVERTER CONSOLE, CCU CONSOLE, CAPACITOR CONSOLE, TOWER BASE SECTION, TOWER ACCESS (1), TOWER ACCESS (2), DOOR FILTERS, SUB-PLATFORM, SUB-FLOOR CABLING, SUB-FLOOR HATCH, TOWER LADDER, LADDER SAFETY CABLE, ELECTRICAL ACC. (1), and ELECTRICAL ACC. (2). The right-hand pane shows a table with columns for 'Nombre', 'Descripción', 'Alarms', and 'Pos.'. The table lists various components and their associated alarm status, such as 'CAB CLEANLINESS (1)' with 'MAIN CONTROLLER' and 'Nerium' alarms.



La tecnología al servicio del mantenimiento

# Evolution of Maintenance Man



# Herramientas para ODR



Recolector  
de datos



Sensores



Software para  
análisis

# Visión global del sistema



Configurar la base de datos y puntos de medición



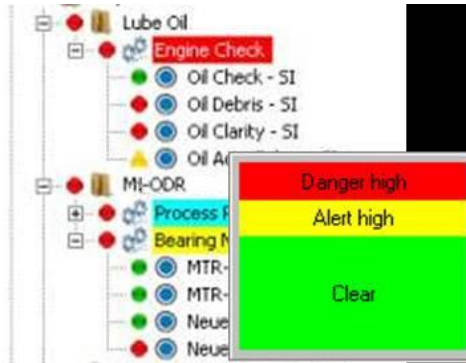
Descargar rutas de inspección



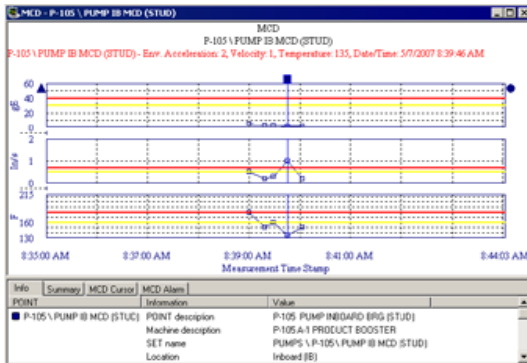
Recoger datos de condición de la maquinaria



Descargar datos de inspección al software



Software para identificar las condiciones anormales



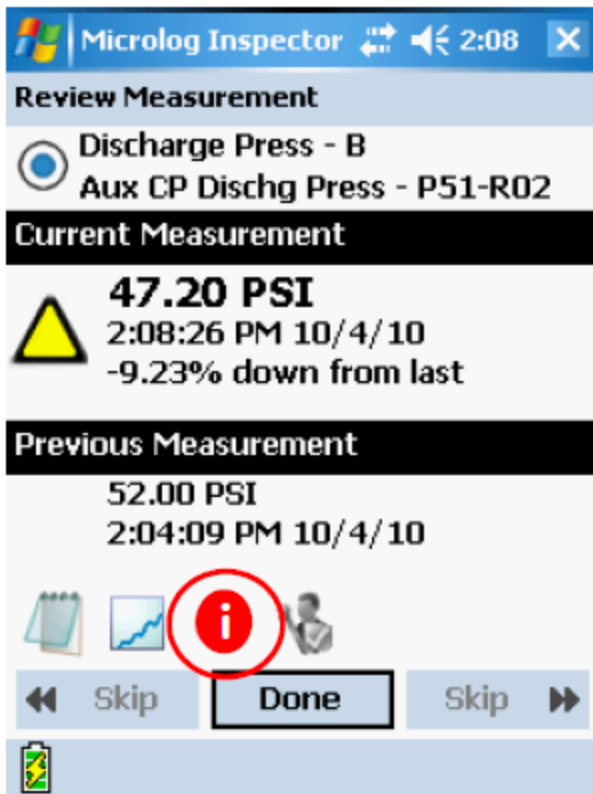
Analizar tendencias y crear informes

# Ejemplos de inspecciones

The image displays several overlapping screenshots from the SKF Microlog Inspector application:

- Top Left:** A Windows taskbar for 'Administrator' at 12:49. Below it, a 'Collect Measurement' window for 'P-105 SEAL INTEGRITY' with 'New Data Entered'.
- Middle Left:** A 'Collect Measurement' window for 'Oil Reservoir' with 'New Data Entered' and 'ID: SEAL INTEGRITY'. It shows 'CONDITION OF SEALS:' with radio buttons for 'GOOD SEALS', 'MINOR LEAKS' (selected), and 'EXCESSIVE LEAKS'. Below are options for oil usage: 'No Action taken', 'Used 10 Litres' (selected), 'Used 20 Litres', 'Used 30 Litres', and 'Used 40 Litres'. A 'Skip' button is visible.
- Middle Right:** A 'Collect Measurement' window for 'Microlog Inspector' at 1:02. It shows 'ID: Hyd System Bosch' and 'Add oil to sight glass level'. Below are radio buttons for 'No Action taken', 'Used 10 Litres' (selected), 'Used 20 Litres', 'Used 30 Litres', and 'Used 40 Litres'. A 'Skip' button is visible.
- Bottom Right:** A 'Collect Measurement' window showing 'Press MCD Button to Start'. It displays three measurement boxes: 'Velocity' (0.04 in/s), 'Envelope Accel' (0.30 gE), and 'Temperature' (74.46 Deg F). A large 'OK' button is on the right. At the bottom, there are 'Skip', 'Cancel', and 'Skip' buttons. A red circle highlights a Bluetooth icon in the bottom right corner.

# Inspecciones condicionadas



Microlog Inspector 2:08

Review Measurement

Discharge Press - B  
Aux CP Dischg Press - P51-R02

Current Measurement

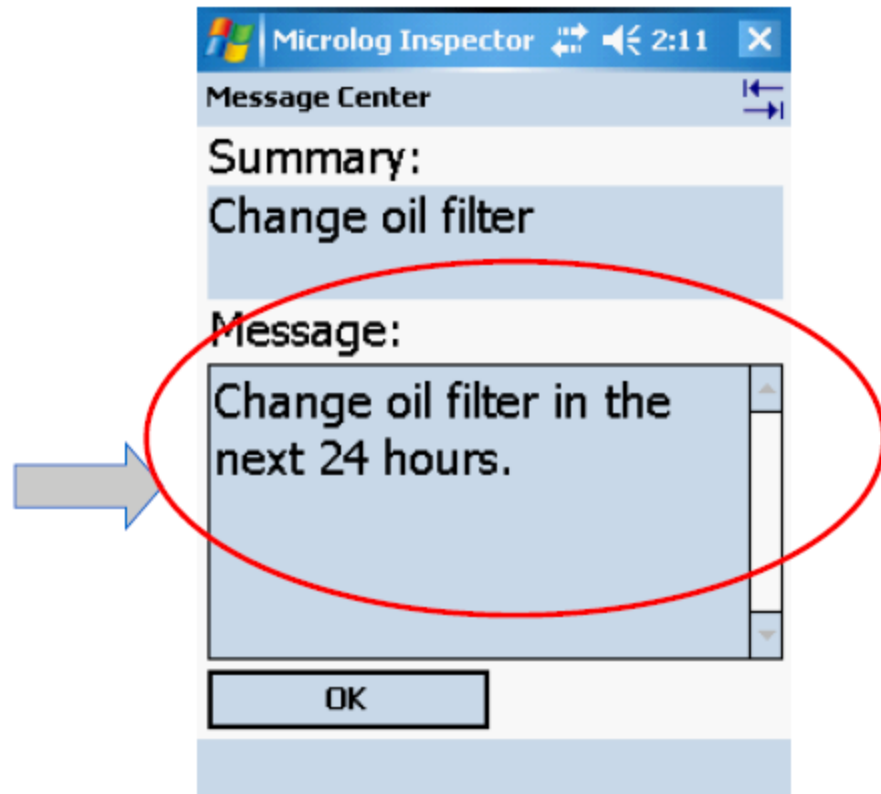
**47.20 PSI**  
2:08:26 PM 10/4/10  
-9.23% down from last

Previous Measurement

52.00 PSI  
2:04:09 PM 10/4/10

Information icon (circled in red)

Skip Done Skip



Microlog Inspector 2:11










Message Center

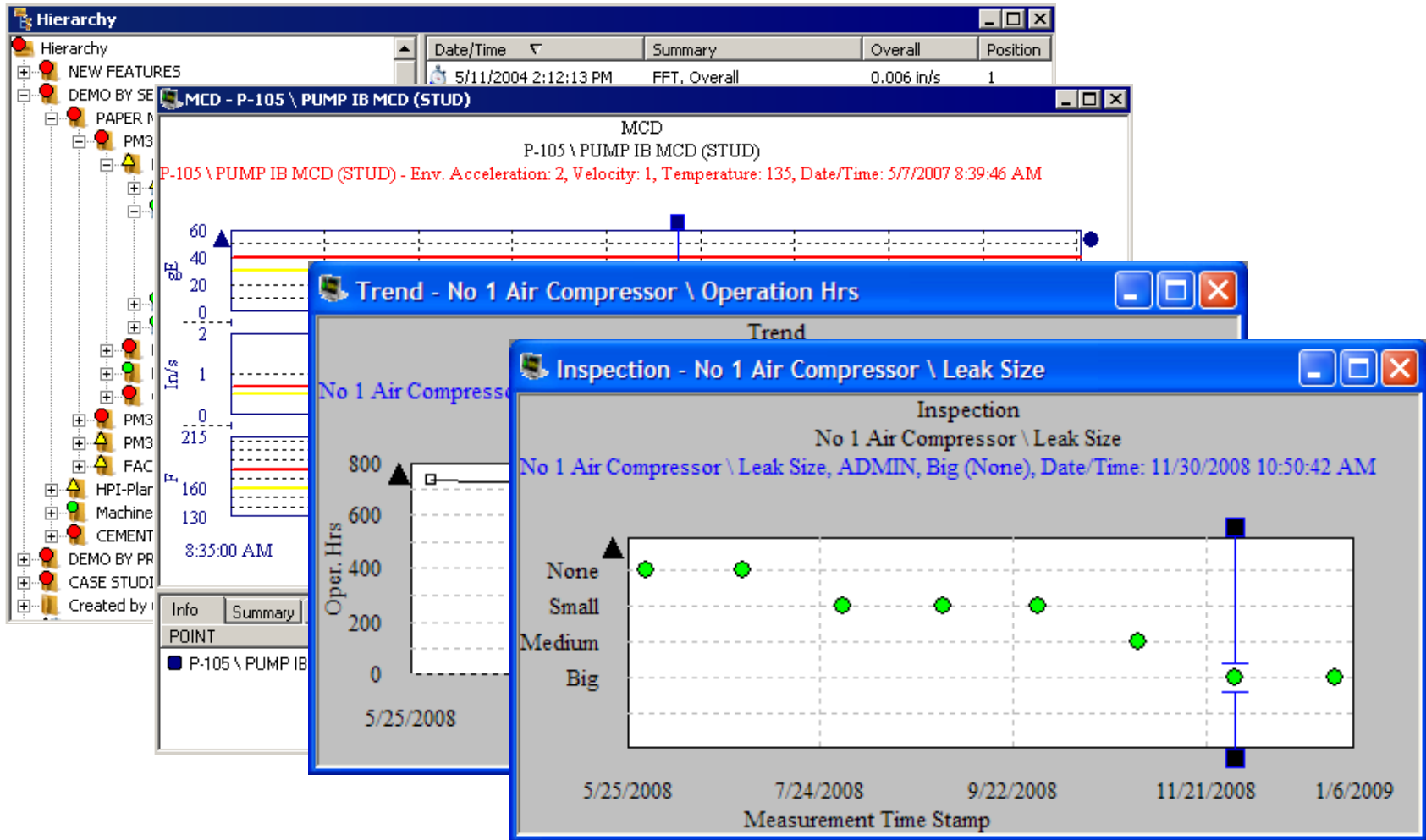
Summary:  
Change oil filter

Message:  
Change oil filter in the next 24 hours.

OK

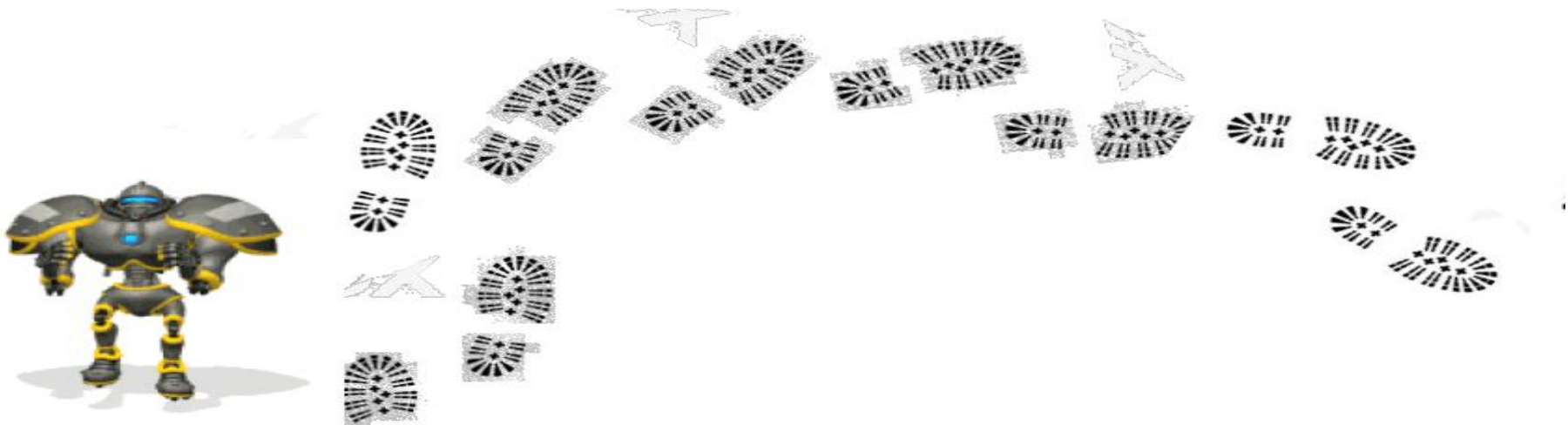


-  ROUTE - at least 1 measurement in alert alarm
-  ROUTE - no alarms, has measurements for all POINTs
-  Set – has an alert, has measurements for all POINTs
-  Machine – has a danger alarm, but not all POINTs collected
-  Machine – all POINTs ‘skipped’ (e.g. Machine OK)
-  POINT – alert alarm
-  POINT – no alarm, has a note
-  POINT – danger alarm
-  POINT – ‘skipped’ due to conditionality, Machine Not Op...





- Tener en cuenta el tiempo disponible del operador.
- Definición clara de los equipos en cada ruta.
- Seguir un recorrido físico del operador.
- Definir orden de recolección de datos.
- Usar el sentido común.



# Implantación del programa

- ✓ Consulta inicial y valoración de necesidades
- ✓ Plan de implementación
- ✓ Instalación y desarrollo
- ✓ Formación / soporte y arranque
- ✓ Revisión y Soporte continuo



# Beneficios ODR: Cultura

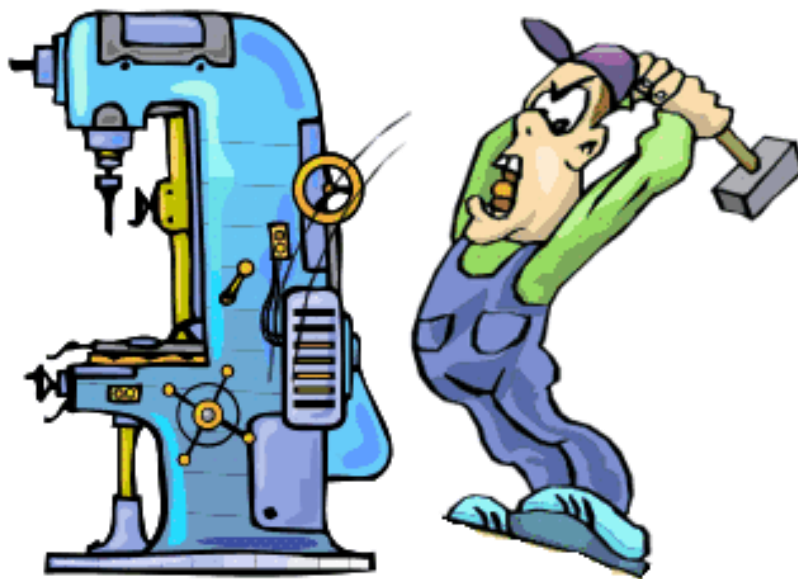
- ✓ Mas gente siguiendo la condición de los equipos.
- ✓ Aumento de la probabilidad de detección temprana de fallos de maquinaria.
- ✓ Fomenta la proactividad y el análisis de causas raíz de fallos
- ✓ Operarios más enfocados e involucrados
- ✓ Detecta oportunidades para la mejora continua



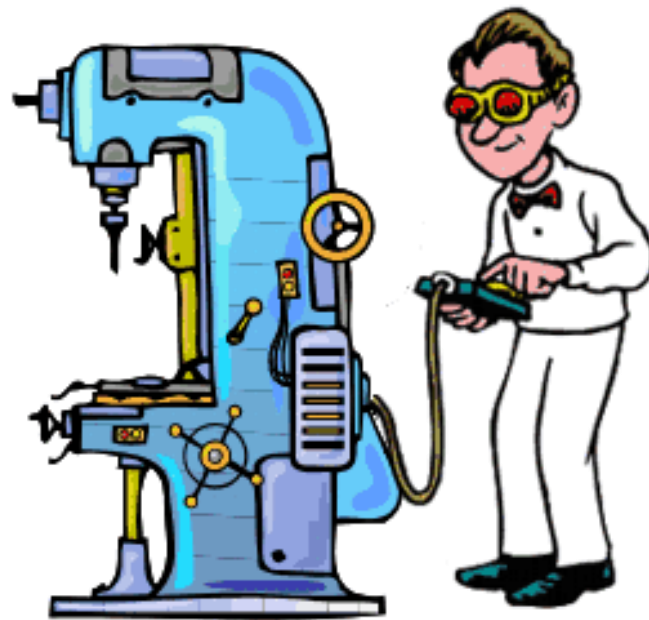
- ✓ Menos paradas no planeadas
- ✓ Aumento de producción
- ✓ Menos pérdidas por falta de calidad
- ✓ Creación de un ambiente de trabajo proactivo
- ✓ Atribuye autonomía a los operarios.
- ✓ Mejor planificación del mantenimiento
- ✓ Aumento de la fiabilidad y el MTBF



# One problem 2 ways



**Pepe**



**Paco**



# EL RETO

- Mire, esto podría ser de interés para usted!

Lo siento, no tengo tiempo, tengo que trabajar!



# Gracias. Por vuestra atención

