ellmann-sueiro & asociados

ESPECIALISTAS EN CONFIABILIDAD

“Installing Reliability Culture in an Energy Generation Company”

- The Company
- The Need
- RCM2 - Project Implementation
- Results Obtained

Description of the Client - Company

The company is one of the most successful electrical business operators in the Mediterranean area. It also provides utility services in other European countries as well as in South and Central America.
The Company accounts for 49.000 MW of Installed Power, having generated 183.000 GWh **in 2007** for over 23 million users.

PROJECT OBJECTIVE

To create a sustainable Reliability Culture supported by RCM2 (Reliability Centred Maintenance), a tool that has been proven worldwide.

Main aims addressed through the reliability culture:

- Identify critical areas and productive process elements with consideration for environment and security issues.
- Identify improvement opportunities.
- Determine the best use of available resources to optimize maintenance on the most intensively used systems and consider the man-power and alternative resources that can be deployed to other areas of Energy Generation Units.
- Document maintenance plan changes to ensure the traceability of implemented decisions.
- Determine reliability improvements for the energy generation equipment.
- Determine the minimum maintenance required to keep assets secure and optimize overall costs.
- Increase maintenance and operations personnel's knowledge of equipment and the production process.

PROJECT DESCRIPTION

The pilot RCM2 project began in 1999. Since then, physical assets and several installations have been included in the ongoing project.

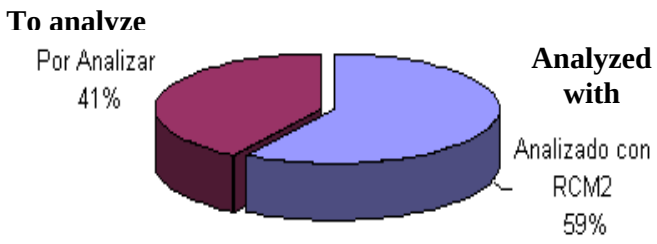
To date, RCM2 has been effectively implemented at 67 power-generating stations in Europe **and Latin America**.

Operating Mode

Over 30 training courses have been run, including the RCM2 Three-Day Course (Reliability Centred Maintenance) and CBM (Condition Based Monitoring). More than 600 maintenance, operations and supervisory personnel have been trained in Spain and five countries of Latin America.
With the aim of achieving a sustainable RCM2 program integrated with the rest of the management tools employed, Ellmann, Sueiro y Asociados` RCM2 practitioners worked jointly with high level company management to plan the process for gradually implementing the technique.
Implementation steps were:

1. Training at vice president management level.
2. Selection of pilot installations.
3. Selection and training of participants and facilitators.
4. Creation of working teams.
5. Selection and implementation of the methodology to be applied for the pilot systems.
6. Extension of the program to the rest of the power stations.

IMPLEMENTATION DATA



About 145000 MW analyzed with the RCM2 technique.

Summary of analyzed systems

- Coal and Fuel Systems at Oil Power Stations: 412
- Diesel Power Station Systems: 57
- Systems at Hydro-Electric Power Stations: 85
- Systems in Combined-Cycle Power Stations: 23

577 Systems Analyzed

- **Communication and Cultural Change**

As a diffusion and communication tool, the company developed an Annual Internal Forum, which is used to centralize all of the analyses done during the year. This forum allows for complete monitoring of project progress, as well as dynamic communication between members of different company sites.

In this atmosphere, objectives are aligned and relevant information is shared with all Analysis Groups from different sites and countries.

In this forum, a “Results Bulletin of RCM2 Implementation at Power Stations” is published monthly. It shows the systems on which studies have been concluded, key performance indicators (KPIs), progress on failure modes analyzed and a power station ranking (calculated in accordance with the specified indicators).

All the information published in the forum is carefully audited by the specialized Reliability Consultants.

In order to stimulate dedication to the process, an Effort and Commitment to the RCM2 Project award, is given to the winning power station. The award is not monetary and is established based on the follows standards:

a. Percentage of objective compliance.
b. Month in which 100% of analyses are completed.
c. Grade of Compliance vs. Standard:

i. Defined Progress
ii. Number of Failure Modes studied at each site
iii. Man-Hours dedicated to the Failure Mode Study

It is important to emphasize the RCM2 Day Event, which takes place twice a year, with the participation of Ellmann, Sueiro y Asociados as Conceptual Auditor of the RCM2 Technique applications.

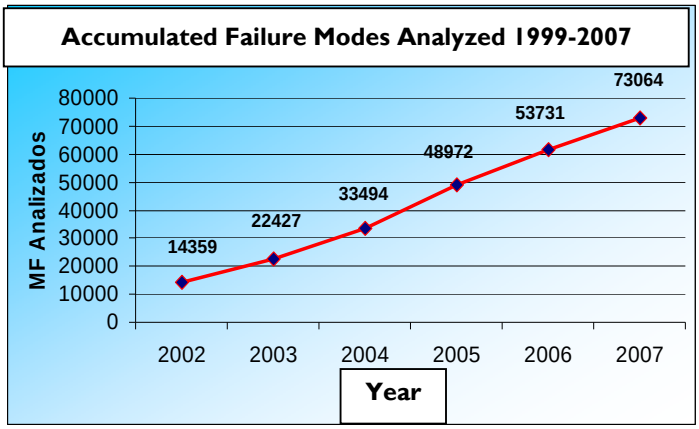
RESULTS and ACHIEVEMENTS

In order to take a real measurement of the project results, Ellmann, Sueiro y Asociados introduced several key indicators:

- New Maintenance Work Orders, defined with RCM2
- New Maintenance Work Orders, defined with RCM2 / Maintenance work orders
- Performed Redesigns / Redesign Proposals
- Percentage of Maintenance Plans optimizated through RCM2 implementation

❖ **Quantitative Achievements**

Over 10 years, the company increased and optimized proactive maintenance plans, dramatically reducing the number of corrective maintenance work orders and increasing the RCM2 work orders / total work orders ratio.



Benefits of the RCM2 application include avoided production loss (achieved through the new RCM2 maintenance strategies) and overall operational efficiency improvement.

According to the process engineering calculations, the benefit was 70 euros / failure mode (exclusive for Europe). This value is used to calculate monetary benefits.

A projection of savings estimate for future years is shown:

Projection

Year	2007	2008	2009	2010	2011
Accumulated FM	49000	64000	79000	94000	109000
Benefits (€)	3.430.000	4.480.000	5.530.000	6.580.000	7.630.000

Results Summary:

- ✓ Increase of overall cost-effectiveness. (Not restricted to Maintenance!)
- ✓ Security and environmental integrity improvement.
- ✓ Better quality and customer service.
- ✓ Extension of equipment life
- ✓ Global database
- ✓ Labor motivation at all levels (participation and empowerment)
- ✓ Operations and maintenance team work.