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## Methodology for the Maintenance Centered on the Reliability on facilities of low accessibility

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### Abstract

This paper presents the importance of obtaining the application of a maintenance technique that satisfies in a precise way the different needs of the production process, independently of its technical complexity or difficulty of access to the industrial plant facilities. This is the case of the plants with a high automation level or wind farms located in remote places with low accessibility. Besides this, the studied situations have in common the low level of physical operation in its production process.

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### 1. Introduction

Added to the difficulty of application of the different maintenance techniques in an optimal way at a reasonable economic cost, there is the difficulty of doing it in complex industrial facilities. In this regard, there appears the need to find a suitable technology which allows reducing the possibilities of an inadequate maintenance, by exceeding in the accomplishment of the activities as for the lack of the same ones, Alsyouf (2009). This way the consequences of important economic losses would be avoided without generating safety risks, environmental risks or risks in the working system. Two examples of this type of facilities are industrial plants with high automation level and flexibility with limited physical operation or facilities placed in locations with a difficult access.

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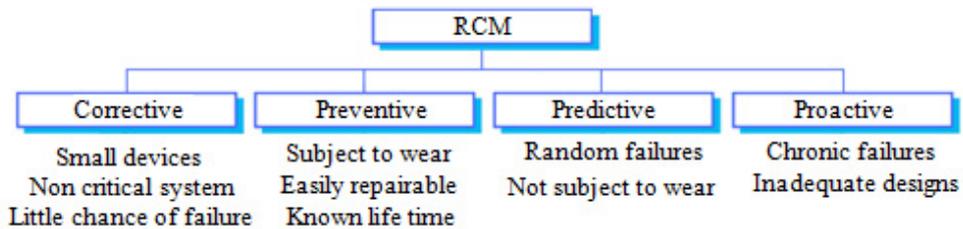
Robotized plants or wind farms are examples of both. Currently, the advances are grater regarding the efficiency and productivity of this type of assets. An inadequate plan of maintenance may reduce their performance. Therefore, these inadequate plans should be reduced.

For assets under study in this paper the key point resides in detecting the failures when they give some type of indication about whether they are going to take place. Then it is possible to study the trend over the election, measurement and monitoring of some relevant parameters representing the good operation of the facility under analysis. The parameters can be temperature, pressure, vibration, linear velocity, angular speed, noise level, thickness, dielectric strength or oil viscosity. Continuous monitoring allows for a historical record of the characteristic in analysis, Lee (2008), and turns out being extremely useful for repetitive failures. Also, this system operates on goods while they are working without having to move them from their location, while allowing use of time without causing production losses associated that stops represent.

**2. Methodology**

In the above conditions, the application of RCM maintenance technique is optimal, since the method is used to determine what it must be done to ensure that a machine or system should continue realizing his duties. Apart from complying with the specifications of SAE JA 1011 norm, in the particular application of limited access facilities it is necessary to carry out the development of maintenance techniques that improve the efficiency of management, finding a strategic work plan, which synthesizes new developments in a coherent model, making possible the evaluation and application of the methods of major value. With this technology it is possible to assure that the physical elements continue preserving the reliability that they themselves possess from his design, manufacture and testing, through performing repairs in the most oportune time so as to minor failures are prevented from producing more serious problems, Scarf (2010). To make this possible it is necessary to develop a maintenance plan which includes corrective, preventive, predictive and proactive maintenance tasks; and that are applied according to the criticality of each component, Zhong (2011); and adjusting tasks at all times to established production targets, optimizing safety and environmental preservation, Yang (2010). In the table 1 outlines the principal composition of the RCM methodology, based on assets, a priori, are more suitable for each maintenance type.

Table 1. Composition of the different techniques to be applied within the RCM by type of asset



For a complete and effective application of RCM of limited access facilities it is required the reliability evaluation of the plant under study using the following methods: FMECA (Analysis of Failure Modes and Effects), RCA (Root Cause Analysis), mathematical modeling (for example Weibull's analysis) and the use of the instrumental technology for condition monitoring (CMS: condition monitoring system). These actions complemented by implementation of performance measurement tools, such as OEE (Overall Equipment Effectiveness), provide accurate and reliable information about the suitability of the tasks and improvements in production processes.

*2.1 FMECA (Analysis of Failure Modes and Effects)*

It is a methodology intended to identify and analyze potential failures and to quantify the effect that these

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