crea
safety engineering

MAINTENANCE OPTIMIZATION

Maintenance Management System

Crea provides technical assistance in achieving an optimized Maintenance Management System. Every design specification should be always verified evaluating effective performances vs design goals and Maintenance Designs shall be verified analysing feedback information.

Some of the possible analysis are:

- Failure Analysis
- Work Order Compliance Analysis
- Business Performance Analysis:
  - *KPI Analysis*
  - *Scoring Models Analysis*
- Business Risk Analysis

Business Performance Analysis

Among these lists, we want to focus over Business Performance Analysis: an important aspect to be analysed is the way in which the performances of Equipment, Systems, Plants and Contractor(s) can be evaluated during any phase of the project but, with particular focus, on the production phase. This goal can be achieved using different methodologies.

Key Performance Indexes (KPI).

KPI's are, by their nature, relatively easy to be evaluated because they are very specialized and consequently they require only few input parameters. On the other side, KPI's are not always enough flexible to analyse the performances in all possible scenarios or to identify the root cause of a low performances.

Incidence of Maintenance cost on unit of product

$$\frac{\text{Maintenance monthly cost}}{\text{Monthly production}} = \$ \text{ / units of product (tons, BOE etc.)}$$

Ratio of Maintenance Cost on Production Cost

$$\frac{\text{Maintenance monthly cost}}{\text{Production monthly cost}} \times 100 = x$$

The choice of KPI depends upon the Maintenance Management Strategies and the Maintenance Organisation Structure. In particular, when Maintenance is executed in the form of Global Maintenance Service, KPI's can have a considerable contractual impact as they constitute one possible quantitative tool for measuring the compliance or discrepancy in respect to the obligations or to the guarantees of contractor.

The data source for all KPI's is represented by a table collecting information from ERP's server or from Data Warehouse. In absence of an automatic synchronization job, that information shall be manually added or a custom stored procedure shall be executed.

Scoring Models.

Scoring Models represent a more sophisticated tool to analyse Equipment, Systems, Units & Contractor(s) performances. To use these Scoring Models, it is necessary:

- To define a *Scoring Model Evaluation Matrix* to judge, in a standardized way, the results.

- To evaluate a *Relative Weight/Importance* of the Scenario/Parameter compared to all relevant (to it) other scenarios/parameters (2 times, 3 times, ½ time, etc.) which will be automatically transformed in a standard percentage (10%, 20%, etc.) once completed the scope.

- To assign a *Score* to obtain a standardized evaluation (usually between 0 & 5) of the scenario/ parameter; these scores will then be weighted in comparison to all others.

- To define a *Set of Rules* to be applied to the Scores & Weights of all Scenarios/Parameters in order to get an *Overall Weighted Score* which is the final result to be used to judge performances (in the same manner as for KPI).

By their nature, Scoring Models are more complex to be defined, because they require more information than KPI's, but they allow the evaluation of performances for complex scenarios and plants possibly identifying the root causes of low performances.

A Risk Matrix shall be developed in order to analyse the impact of unwanted events on particular sensible areas like for example:

- Conformity to Project Specifications
- Conformity to Forecasted Costs
- Conformity to Forecasted Time Schedule
- Conformity to HSE Requirements
- Conformity to Company Reputation Requirements
- Etc.

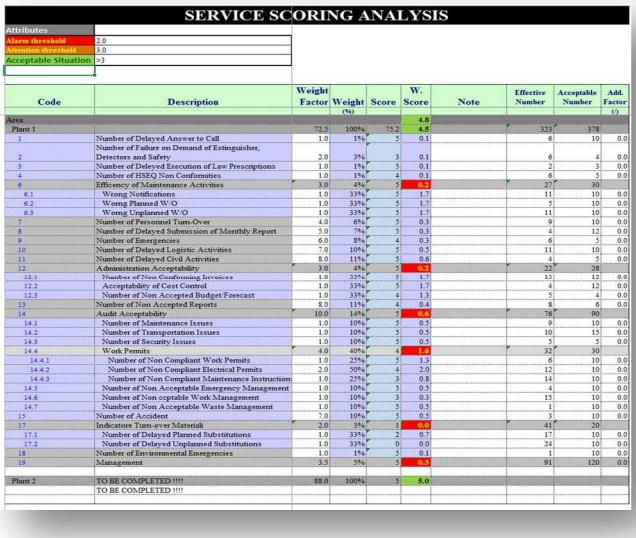
Some examples of Performance Scoring Models are listed below:

- Support Service: this scoring model allows managers to verify if *Support Service Contractors* have fit their contractual obligations or not, identifying the limitation defined by the contractual articles and assigning a score which is proportional to the deviation from maximum allowed quantity.

- Production: this allows managers to verify if *reached productions fit target productions* split in the relevant periods and production loss causes.

- Risks: they allow managers to analyse the Business, assigning scores to judge the particular *Business Features* and verifying, in such a way, if the *Business Features* has reached *Business Goals* or not. In an Audit Analysis, a Risk Scoring Model can be used before and after possible *Corrective Actions*.

- System/Equipment Survey: this Scoring Model has the goal to verify if an assembly of equipment and systems has reached its production goals; user shall insert master data while scores and score weights are automatically assigned using information from master data.



SERVICE SCORING ANALYSIS

Attributes	
Alarm threshold	2.0
Attention threshold	3.0
Acceptable Situation	>3

Code	Description	Weight Factor	Weight (%)	Score	W. Score	Note	Effective Number	Acceptable Number	Add. Factor ()
Area					4.8				
Plant 1		72.5	100%	75.2	4.8		321	378	
1	Number of Delayed Answer to Call	1.0	1%	5	0.1		6	10	0.0
2	Number of Failure on Demand of Estinguisher, Detectors and Safety	2.0	3%	3	0.1		6	4	0.0
3	Number of Delayed Execution of Law Prescriptions	1.0	1%	5	0.1		2	3	0.0
4	Number of HSEQ Non Conformities	1.0	1%	4	0.1		6	5	0.0
6	Efficency of Maintenance Activities	3.0	4%	5	0.2		27	30	
6.1	Wrong Notifications	1.0	33%	5	1.7		11	10	0.0
6.2	Wrong Planned W/O	1.0	33%	5	1.7		5	10	0.0
6.3	Wrong Unplanned W/O	1.0	33%	5	1.7		11	10	0.0
7	Number of Personnel Turn-Over	4.0	6%	5	0.3		9	10	0.0
8	Number of Delayed Submission of Monthly Report	5.0	7%	5	0.3		4	12	0.0
9	Number of Emergencies	6.0	8%	4	0.3		6	5	0.0
10	Number of Delayed Logistic Activities	7.0	10%	5	0.5		11	10	0.0
11	Number of Delayed Civil Activities	8.0	11%	5	0.6		4	5	0.0
12	Administration Acceptability	3.0	4%	5	0.2		22	28	
12.1	Number of Non Conforming Invoices	1.0	33%	5	1.7		13	12	0.0
12.2	Acceptability of Cost Control	1.0	33%	5	1.7		4	12	0.0
12.3	Number of Non Accepted Budget Forecast	1.0	33%	4	1.3		5	4	0.0
13	Number of Non Accepted Reports	8.0	11%	4	0.4		8	6	0.0
14	Audit Acceptability	10.0	14%	5	0.6		76	90	
14.1	Number of Maintenance Issues	1.0	10%	5	0.5		9	10	0.0
14.2	Number of Transportation Issues	1.0	10%	5	0.5		10	15	0.0
14.3	Number of Security Issues	1.0	10%	5	0.5		5	5	0.0
14.4	Work Permits	4.0	40%	4	1.4		32	30	
14.4.1	Number of Non Compliant Work Permits	1.0	25%	5	1.3		6	10	0.0
14.4.2	Number of Non Compliant Electrical Permits	2.0	50%	4	2.0		12	10	0.0
14.4.3	Number of Non Compliant Maintenance Instruction	1.0	25%	3	0.8		14	10	0.0
14.5	Number of Non Acceptable Emergency Management	1.0	10%	5	0.5		4	10	0.0
14.6	Number of Non coptable Work Management	1.0	10%	3	0.3		13	10	0.0
14.7	Number of Non Acceptable Waste Management	1.0	10%	5	0.5		1	10	0.0
15	Number of Accident	7.0	10%	5	0.5		3	10	0.0
17	Indicatore Turn-over Materiali	2.0	3%	1	0.0		41	20	
17.1	Number of Delayed Planned Substitutions	1.0	33%	2	0.7		17	10	0.0
17.2	Number of Delayed Unplanned Substitutions	1.0	33%	0	0.0		24	10	0.0
18	Number of Environmental Emergencies	1.0	1%	5	0.1		1	10	0.0
19	Management	3.5	5%	5	0.3		91	120	0.0
Plant 2	TO BE COMPLETED !!!!	88.0	100%	5	5.0				
	TO BE COMPLETED !!!!								

To use Scoring Models, it is necessary:

- To create a Hierarchical set of Attributes to be kept under control
- To assign a Weight (relative to other Attributes) to each terminal Attribute (a leave of hierarchy tree)
- To standardize as % all relative weights
- To assign a Score (which could be also obtained by a very complex formula) to Each Terminal Attribute
- To calculate the Weighted Scores for Each Terminal Attribute.

Contacts

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