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## **INTEGRATED ON-LINE WAREHOUSE MANAGEMENT SYSTEM FOR POWER PLANTS SPARE PARTS SUPPLY**

### **INTRODUCTION**

Proper planning and control of spare parts inventory is one of the most critical components of an effective asset power plant management program.

If the right spare parts are not on hand when needed in emergency case, for routine maintenance or repairs, downtime of the power plant is prolonged and considerable loss of profit is generated.

On the other side, if too many spare parts are on stock, the enterprise absorbs excessive costs and the overhead of carrying the inventory.

There are proven and true strategies to manage spare parts logistic in support of effective asset management, along with some that can be considered questionable, and a variety of new and innovative practices.

One proven method for efficient spare parts management without incurring additional long-term expenses is the implementation of Integrated On-line Warehouse Management System (IOWMS).

IOWMS is the perfect choice to handle the logistics functions for the most complex distribution centers or manufacturing locations.

It is much more than a typical warehouse management system. It is a decision support system with real-time inventory visibility that enables the logistics professional to expertly manage the movement and storage of all spare parts within a facility.

Using real time material tracking it can take advantage of all available space and resources.

### **BENEFITS & SPARE PARTS MANAGEMENT**

The IOWMS can provide an organization with tangible benefits quickly, improving warehouse operations and increasing efficiencies without adding headcount.

The primary benefits of implementing IOWMS include:

- Fully integrated online, real-time processing for rapid order turnover;
- Easy spare parts worldwide sourcing;
- Optimized spare parts ordering and distribution;
- Fast entry input from numeric keypad;
- Optimized spare parts stock keeping;
- Optimized spare parts handling by application of mobile computing using wireless barcode scanning;
- Optimized warehouse capacity management;
- Keeping of detailed life-history of tagged spare parts;
- Greatly simplified administration;
- Simplified logistics;

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- High quality information flow and large range of management tools;
- Instant stock review including also continuous (day by day, week by week, et..) "traffic" analysis.

The secondary benefits – benefits to power plant owner – of implementing IOWMS include:

- Fast, on time, spare parts delivery;
- Reduced power plant down time;
- Optimized power plant efficiency and capacity utilization;
- Significantly reduced maintenance time and costs;
- Increased equipment reliability and safer operation by using high quality spare parts;
- Cost saving by not having spare parts warehouse

IOWMS makes spare parts stock management easy. It helps not only to monitor spare parts shrinkage but also reduce the amount of cash tied up in spare part stock by reducing losses on obsolete spare parts stock keeping and optimise spare parts stock holding.

Another important features of IOWMS spare parts stock control are:

- Supports efficient individual customer (power plant) response including customer forecasts for inventory forecasting;
- Lookup stock quickly by code or barcode scanning;
- Easy and fast identifying of shelf locations;
- Automatic spare parts sales & purchases updating (stock level / value update)
- Generating of extensive spare parts stock reports;
- Linked supplier & supplier product codes;
- Link to purchaser & supplier system for each product;
- Automatic generation of supply / purchase orders to re-stock up to pre-defined ceiling levels;
- Overview of future available spare parts stock for each customer (power plant) and calculation of combined net spare parts stock requirements;
- Direct spare parts ordering from PC;
- Supplier / purchaser relationship management;
- Vendor-managed inventory;
- Simulation and evaluation of purchase interval, and/or new prices to optimize the purchase quantity by value, weight, volume etc.;
- Enabling of interactive forecast simulation for "what if" analysis;
- Multi site order allocation capability that allows a single order to be split between multiple distribution points in order to deliver the spare parts as quickly as possible;
- Full product traceability and recall reporting;
- Full purchase back-order control.

All these benefits and system features translate into direct and indirect cost savings. The extent of these savings depends on a number of factors including existing inventory levels and accuracy, premium shipping costs and personnel currently required for picking, packing and shipping.

### **SPARE PARTS CATEGORIZATION & CRITICALITY RATINGS**

In order to optimize the spare parts stock keeping and to ensure that all critical spare parts are available within specified time, the spare parts are divided into categories with reference against "Criticality Ratings" as follows:

- **Category 1 - Strategic Spare Parts**

Spare parts for major power plant key components, which failure would result in a significant commercial, safety or environmental impact. Spare parts with a long lead-time.

- **Category 2 - Breakdown Spare Parts**

All spare parts of Criticality Rating 2 and/or 3 as described below.

- **Category 3 - Routine Service Spare Parts**

Spare parts, which shall be used for scheduled servicing of components.

- **Category 4 – Major Overhaul Spare Parts**

Spare parts, which are necessary for minor and major inspection and major overhaul. Some of the items in this category may also feature in some of the above categories. These spare parts are additional to routine spare parts.

- **Category 5 - Operational Consumable Spare Parts**

Essential materials necessary for normal power plant operation. Expected to be supplied on planned regular intervals.

- **Category 6 - Tools & Equipment Spare Parts**

Tools, materials, equipment and components used for carrying out any planned or unplanned work on operational plant.

- **Category 7 - General Purpose Materials**

Material and equipment used for minor fabrication or repair work.

- ✚ **Criticality 1**

- Causes forced outage

- Causes forced derating

- Danger to personnel

- Causes major damage to plant

- Causes unacceptable breach of environmental limits

**+ Criticality 2**

- No forced outage
- No derating
- No danger to personnel
- Significant risk of forced outage
- Significant risk of forced derating
- Major loss of plant performance
- Significant plant damage results
- Operational inflexibility results
- Reduces environmental performance

**+ Criticality 3**

- No availability loss
- No flexibility loss
- No reduction in environmental performance
- Will eventually result in full or partial outage
- Immediate or gradual reduction in plant performance
- Eventually results in plant damage and/or excess wear and tear

**+ Criticality 4**

- No partial outage result
- No danger to personnel
- No reduction in plant performance
- No plant damage result
- Causes a nuisance
- Long-term operation causes some wear and tear

**+ Criticality 5**

- No loss of performance or generation but continued operation is regarded as abnormal.

The philosophy behind the categories is to provide a framework for the IOWMS to assist in the evaluation of the level and types of spares holdings, taking account of all the relevant factors.

These factors relate mainly to the commercial, safety and environmental impact; the lead times and delivery logistics as well as the cost and power plant reliability.

The criticality ratings show the consequences of a plant failure and hence assist in determining the need for the spares holding.

## **SUMMARY**

IOWMS enhances the overall spare parts warehouse operation with considerably improved data and spare parts inventory accuracy.

Mistakes are pushed to an absolute minimum. Spare parts deliveries are on time with ability to receive orders and ship same day without expediting.

IOWMS is a decision support system with real-time inventory visibility that enables the spare parts distributor to professionally manage sourcing, ordering, storage and distribution of all spare parts within his responsibility.

Progressive spare parts distributors have realized that to compete in today's market place, they must be able to provide the customer with high levels of customer service, quality, accuracy, and visibility while keeping costs to a minimum.

In order to increase the efficiency and reliability as well as to maximize equipment operational lifetime and profit, more and more modern power plants turn to advanced IOWMS.

Power plants that fail to address these concerns risk losing market share and falling behind their competition.

### **ADDITIONAL SERVICES**

In addition to IOWMS we can provide the following advisory services related to IOWMS:

- **Condition Base Evaluation (CBE)**  
CBE helps power plant management decide if and when installed power equipment needs to be repaired, upgraded or replaced in order to maximized operation efficiency and availability as well as to increase the operational revenue.
- **Aging Management (AM)**  
Similar to CBE, the AM is a basis for reliable, efficient and economical operation of power plant. The main goals of AM are
  - Increased efficiency of components
  - Determination of remaining power plant life
  - Long term investment planning
- **Condition Based Maintenance (CBM)**  
The main objective of CBM is reducing to the minimum the risk of unforeseen failures and shutdowns of the power plant and its components.
- **Risk Based Inspections (RBI)**  
RBI enables power plant management substantially increase power plant reliability, reduce the number of failures and cut the time required for regular inspections and major overhauls.