Top 6 Do's & Don'ts of Engineering Maintenance

Dr. Manish Bhatt, VP Engineering – Hester Biosciences Limited, has over 25 years experience in engineering maintenance in a variety of industries including; Biotechnology, Water Management, Fertilizer, Chemical, Oil and Gas Refinery. Dr, Manish specializes in design engineering, project management and detailing documentation & records for analysis. Below are his tips to successfully execute an engineering maintenance plan.

Do:

1. **Ensure that material, equipment and machinery are suitable for the process requirement;** wrong selection will always affect process design and increase maintenance required.

    - Design & engineering must be suitable for the process requirements; fully complete the project on paper before execution starts to increase efficiency.
    - The following project planning will facilitate effective design and engineering:

        - Kick-off meeting
        - Stage-wise submission of documents on design & engineering
        - Master documents/Drawing list
        - Comment/Reply summary document
        - Progress indicators
        - Erection & commissioning documents

2. **Effective documentation:** from identification to final reports & history cards; thorough detail and man-hours are required however, once the documentation is in place, this part of the system will only need to be monitored and tracked.

    - Before starting any documentation, a structure needs to be put in place divided into four major categories:

S/N	Document description	DEFINITION
1	Identification Protocols	Defining protocols of documents will only need to be done once and will not change at later stage.
2	Controlled Documents	Master set of documents which will rarely change.
3	Support Documents	These support documents are in relation to controlled documents; they are in record form and will change as per frequency.
4	Reference Documents	Used for reference, these documents will only need to be prepared once and will include information about suppliers, standards and local authorities.

    - **The documentation process is interlinked for categories 1, 2 and 3;** Unless you freeze Identification Protocols you cannot start Controlled Documents. On the basis of Controlled Documents, Support Documents will be generated.
    - Reference Documents are independent documents which are collected from suppliers, local authorities, ISO standards and GMP guidelines.

3. **Monitoring and tracking:** putting processes and tools in place are essential as human error does occur; key tools include check sheets, log-sheets, preventive maintenance sheets & history cards.

    - **Log-sheets** are compulsory for recording data and tracking the performance of machinery. Before starting, any machine **check-sheets** need to be filled out to crosscheck the parameters are healthy prior to running the machinery.
    - When to carry out **preventative maintenance** can be decided based on log and check sheet results – determining whether PM needs to be executed routinely or at an earlier/later stage.

Case study: Preventive Maintenance:

1) RO-I Plant:

- In an RO-I Water Plant, regeneration was needed on completion of 1,000,000 litres of water production. Log-sheets were used to help count the production and identify the time of regeneration. Installing flow metres in the water lines meant the log-sheet reading was recorded and regular regeneration executed.

2) Chiller plant:

- Preventative maintenance procedures using chilled water circulating pumps is planned every three months however if noises are observed during machinery operation this would be recorded in the **check-sheet** and preventive maintenance would need to be implemented early.
- Precisely defined log-sheets, preventive maintenance sheets and check-sheets for all machinery **significantly reduce the room for human error.** The check-sheet simply requires a tick (√) or YES/NO. The log-sheet requires readings to be filled out of parameters of the machine. The preventive maintenance sheet gives guidelines of what to do and when to do, this makes it easier for employees because there is a pre-defined guided path to work to.
- From **history cards** we come to know which parts need frequent repair/maintenance and therefore can accurately forecast down time and calculate cost.

Don't:

1. **Compromise on design and engineering:** it may save cost initially but at later stage maintenance, breakdown and reduced production will be more costly.

    - Crucial factors such as materials used, required capacity, utilities, environmental conditions and operational hours are often overlooked when designing machinery; if these are not identified and addressed then machinery will not perform at the optimum level and breakdowns are more likely to occur.
    - User Required Specification (URS) need to be thoroughly understood.
    - Moving parts have the highest failure rate as wear & tear is higher.
    - Material selection, design, use and construction play a vital role in uninterrupted operation and long life of the equipment/machinery.

2. **Overlook details:** especially in the initial stages; this will cause numerous problems further down the line and result in more man-hours being required as a result.

    - Poor documentation will result in inaccurate analysis, thus leading to miscalculated decisions for which maintenance strategies to apply.
    - Systems need to be fit for purpose to avoid loss of production time and machinery breakdown.
    - Engagement of the team from the early stages is essential to identify and overcome potential problems before the processes are put in place.

3. **Fail to expand in-house expertise:** with a lack of experienced manpower in the industry it is essential to provide in-house and external technical training to ensure operations are run efficiently and mistakes are not made.

    - Implement knowledge-based management systems and KPIs for monitoring operational efficiency of maintenance engineering processes
    - Inter-department communication is the key for successful execution of an engineering maintenance programme. It is important to implement an effective communication plan throughout the entire organization to ensure consistency.
    - Maintain employee retention through development plans (360 degree growth), monetary rewards and effective communication.

Dr. Manish is speaking at the upcoming ***Process Industry Engineering Maintenance Summit India 2011,*** *being held at the Hilton Mumbai International Airport Hotel from 10-11 October 2011, for further information please visit www.engineeringmaintenanceindia.com.*