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# Torque Mapping and Productionization of a Compressor

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***Abstract*: The aim of this work is to bring the proposed torque for bolts and fittings to prevent them from getting loosening while the compressor is running. Then the procedures followed to bring the new product from prototype into an existing production line in an effective manner. So that it can be ready for the production without any problem.**

***Keywords*: Torque, Production, Compressor**

## 1. Introduction

A project work for a college graduate, apart from being part of academics helps one to apply his technical skills onto a real-time application based issue. It also helps in molding one's mind by making one apply whatever he had learnt from random pages of any book. It aids in building mere problem solving ability.

An industrial project is the one which helps a graduate to have an industrial exposure, which prepares him for his future when his career commences at any company. It completely sculpts an individual in building extreme human relations and contact. Thus, an industrial project works in many attributes superior over a usual project work. Their rotation and also controls the record and repeat options [14] ,which makes the lathe machine into smart machine thus allowing the machine to run continuously for many repeated cycles which makes the machine best suited for batch production in small scale industries.

## 2. Torque Mapping

### *A. Why do bolts loosen?*

It is widely believed that vibration causes bolt loosening. By a detailed analysis of the joint it is possible to determine the clamp force required to be provided by the bolts to prevent joint slip. Often fatigue failure is a result of the bolt self-loosening which reduces the clamp force acting on the joint.

### *B. How to prevent bolts from loosening?*

- Thread a self-locking nut on the bolt and tighten with the appropriate wrenches.
- Slip a split, or lock, washer over the bolt end.
- Paint thread-locker compound all the way around the bolt threads as far down as possible.
- Thread the nut on the bolt and tighten with the appropriate Torque with the wrenches.

So that we decide to do the activity of torque mapping to set a proposed Torque for the bolts and fittings. Generally, they have the appropriate Torque for the bolt size and for the fittings they don't have it all. And also the bolts Torque is also not finalized. So we decided to do the Torque Mapping Activity to calculate the proposed Torque for the Bolts and Fittings.

Bolts are the fastener of choice in multiple industries and applications for the simple reason that they are easy to dismantle. However, this also makes them vulnerable to self-loosening and loses of preload.

### *C. Finalised proposed torque value*

Table 1
Proposed torque value for bolts/nuts/Allen bolts/fittings

| Size | Proposed Torque (Nm) |
|---|---|
| M4 | - |
| M5 | 5 |
| M8 | 15 |
| M10 | 33 |
| M12 | 46 |
| M16 | 105 |
| M20 | 140 |
| 1⁄8’ | 18 |
| 1⁄4’ | 22 |
| ½’ | 48 |
| ¾’ | 59 |
| 1’ | 75 |

## 3. Productionization of a compressor

### *A. Exploded Views Vs. Bom Tally*

An exploded view drawing is a diagram, picture, schematic or technical drawing of an object, that shows the relationship or order of assembly of various parts.

An exploded view drawing is a type of drawing, that shows the intended assembly of mechanical or other parts. It shows all parts of the assembly and how they fit together. In mechanical systems usually the component closest to the centre are assembled first, or is the main part in which the other parts get assembled. This drawing can also help to represent the disassembly of parts, where the parts on the outside normally get removed first.

### B. Process Flow Chart (PFC)

The process flow chart represents the steps involved in the process. The process flow is in order to assemble the product effectively without reworking. Process Flow Chart also gives the information like what kind of assembly it is, whether a loose fitment or tightened at the same process. The loose fitments are tightened in some other process. It is because to reduce the assembly difficulties and reworking. The process is given step by step to assemble a product.

Process Flow Chart also includes columns like incoming components, machine or facility type, process and product characteristics, Incoming source of variation, Lessons learned.

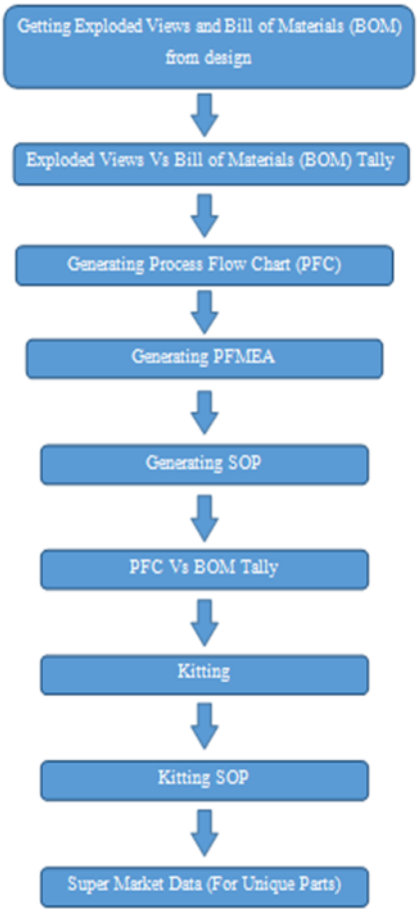


Fig. 1. Process flow chart

### C. Potential Failure Mode and Effect Analysis (PFMEA)

The purpose of the PFMEA is to take actions to eliminate or reduce failures, starting with the highest-priority ones. Failure modes and effects analysis also documents current knowledge and actions about the risks of failures, for use in continuous improvement. PFMEA is used during design to prevent failures.

### D. Standard Operating Procedure (SOP)

A Standard Operating Procedure (SOP) is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations.

An SOP is a procedure specific to your operation that describes the activities necessary to complete tasks in accordance with industry regulations, provincial laws or even just your own standards for running business. Any document that is a "how to" falls into the category of procedures. In a manufacturing environment, the most obvious example of an SOP is the step by step production line procedures used to make products as well train staff.

#### 1) Preparation of SOPs:

- Date of approval
- Company's Logo
- SOP number
- Format number
- Department under which the product is to be produced
- Model name
- Type of Station
- Authorities information
- Page number and total number of pages
- Instructions at each pages end

### E. Kitting

The process of kitting is often used in manufacturing companies as a way of, reducing material handling and processing times and improving line side assembly. While it's not without its challenges the implementation of kitting has numerous advantages.

### F. Kitting SOP

In kitting SOP the components in each and every kit box are numbered. The numbers are noted in ascending order and it is in clockwise direction and the descriptions of the components are entered in their respective numbers. By which the technicians can easily identify the parts with its description.

### G. Super Market Data

Super Market Data contains the parts which does not exist in the Store and it is the unique part of the product. So we have to allocate the suitable place in Store. For that we require Length, Breadth, Height and Weight of the product. And it also includes the name of the supplier for that parts.

To get that Length, breadth, height and weight of the parts. We have to check in PLM (Product Lifecycle Management), where all the parts are uploaded in that.

If the Length, breadth and height of the parts is sufficient for placing that component in the Store then it is allowed for

Table 2
Super market data

| Part Description | Part No. | Length | Breadth | Height | Weight | Quantity | Supplier |
|---|---|---|---|---|---|---|---|

placing the component in the Stores.

## 4. Conclusion

As the above procedures followed for implementing a new product from protoshop to production line are followed and the documents like Process Flow Chart, Product Failure Mode and Effect Analysis, Standard operating Procedure, Kitting for components, Kitting Standard operating Procedure, Supermarket Data are prepared. The product is now ready to move to the production line and ready for production.

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