

## Appendix J – Creating a Lean Process (for Overhaul)

This appendix highlights tools<sup>1</sup> to make the overhaul process more efficient and improve the quality of the outputs.

### 16.8.1 Create a process improvement culture

Having the right workplace culture is key to successfully implementing and embedding the process improvement techniques described below. In a workplace with an improvement-focussed culture, staff will:

- know what the common goal is and what good looks like,
- understand the role they all play in delivering the goal,
- feel empowered to identify problems and make improvements<sup>2</sup>,
- be supportive of colleagues and work as a team to achieve the common goal and
- feel pride in a job well done.

It is critical to create a culture where staff feel able to identify problems and are involved in creating the solutions.

### 16.8.2 Identify and eliminate waste

Activities are either value adding (VA) or non-value adding (NVA). VA activities are those which:

- transform the asset,
- the customer cares about (i.e. would pay for) and
- are done right first time (correcting a defect created within the process is not value adding).

NVA activities are also called waste. It is good practice to identify and eliminate/reduce them. They can be identified as follows:

- **Transportation**  
Transportation is movement which occurs between process steps (e.g. if the asset needs to be sent away from the main overhaul facility to another facility for specialist work, or if the asset needs to be moved from one part of the facility to another). In these examples, transportation could be eliminated (or minimised) by bringing the specialist to the main overhaul facility or by optimising the facility layout.
- **Inventory**  
Inventory is having too much stock. Good stores management will ensure that there is the right amount of equipment available for the overhaul and that larger items are ordered in a timely manner so that they are delivered to the point of use when required.
- **Motion**  
Not to be confused with transportation, motion concerns in-process movement. While the asset is being worked on, if the worker has to go to the stores to collect equipment, this is wasteful. Ideally the worker should move as little as possible and have all tools and equipment easily to hand.
- **Waiting**

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<sup>1</sup> This is not intended to be a comprehensive summary of all lean techniques.

<sup>2</sup> This does not mean making unilateral changes without involving anyone else.

Waiting occurs as a result of bottlenecks because part of the process takes longer than others (i.e. the process flow is not balanced). In a process like overhaul, which typically has only one asset being worked on at a time, bottlenecks could result in people having nothing to do whilst waiting for colleagues to finish. Multiskilling staff or combining process steps are ways in which the process flow can be balanced, and bottlenecks removed or reduced.

- **Over-processing**

Over-processing is doing more than required to the asset. To prevent this, there should be standards or guidelines for each task so that it is clear what is expected and that it is done consistently by all members of the team.

- **Over-production**

Over-production may not be a common form of waste in the overhaul process. It is typically where more items are produced than required. This could be a symptom of process problems which cause variation in quality.

- **Defects**

Defects are mistakes. There are many reasons why mistakes occur (e.g. having the wrong tools, equipment, plans or training). It is important to identify defects early in the process and be able to identify the underlying cause, otherwise they could re-occur. Process handovers are a good opportunity to identify defects early and reduce the impact of the asset reaching the end of the process and requiring correction.

Another way to eliminate waste is by using 5S. It is a particularly good technique to improve in-process activity:

- **Sort**

Ensure that the workstation only has the tools, material and work instructions required for the activity being undertaken at that workstation. This reduces the risk of defects caused by using the wrong work instruction or tool.

- **Set**

Arrange items to ensure efficient workflow and eliminate time looking for tools or materials.

- **Shine**

Ensure the work area is clean. This reduces the risk of contamination and enables defects to be spotted more easily.

- **Standardise**

Where possible, ensure consistency between workstations (e.g. use of shadow boards, electronic version-controlled work instructions.)

- **Sustain**

Ensure that improvements are embedded in standard procedure so that they are not forgotten about once a 5S drive has ended.

### 16.8.3 Root cause analysis

There are many reasons why defects occur, and it is important to consider all factors before attributing cause. Too often, individuals are blamed for causing a defect without considering other factors. This can harm employee relationships and will not necessarily prevent the defect from re-occurring in the future. In order to identify the true causes behind a defect, it is important to engage those involved

to utilise their expertise and obtain their buy-in to implementing any changes.

- **Cause and effect<sup>3</sup> analysis**

This is a useful tool to identify all possible causal factors for a defect. It helps prevent individuals assuming one particular cause without considering other possibilities.

- **5 whys?**

This is a useful technique to apply after the cause and effect analysis. It helps to identify the true root causes, which is important if the solution is to be properly embedded within the process to prevent the problem re-occurring in the future.

Once the causal factors have been identified, it is important to select the most likely root cause(s). This can be done by data collection or group to vote<sup>4</sup> (as appropriate).

#### **16.8.4 Evaluate the outcome**

Yield is a useful measure. There are different ways of calculating yield, so it is important to decide which is the most appropriate for the operation in question during the mobilisation stage.

- **Process yield**

Gives the quality at the end of the process and can be used as a proxy for customer satisfaction<sup>5</sup> but does not take into account re-work.

- **First-time yield**

Gives the quality at any point in the process.

- **Rolled yield**

Gives the probability that an item will pass through the process defect-free.

- **Normalised yield**

Gives the average yield per process step.

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<sup>3</sup> Also commonly known as a fishbone diagram or Ishikawa.

<sup>4</sup> Use n/3 voting where n is the size of the group. Each member gets the same number of votes and can cast them on the cause and effect diagram using sticky dots. This can be done in silence (to prevent more vocal members from dominating the discussion). The issues with the most votes should be addressed.

<sup>5</sup> Assuming that customer (in this case the TOC) satisfaction only relates to the quality of the overhaul output. Yield does not take into account other factors such as on-time delivery and cost.

