

Appendix J – Creating a Lean Process (for Overhaul)

This appendix highlights some tools¹ which can be applied 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 a key enabler to successfully implementing and embedding the process improvement techniques described below. In a workplace with an improvement-focused 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 improvements¹⁷,
- ✦ 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 & 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 (therefore 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 point of use when required.

✦ **Motion**

¹ This is not intended to be a comprehensive summary of all lean techniques. ¹⁷ This doesn't mean making unilateral changes without involving anyone else.

Not to be confused with transportation, motion is concerned with 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 required easily to hand.

✦ **Waiting**

Waiting occurs as a result of bottlenecks because part of the process takes longer than other parts (i.e. the process flow isn't 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 they are waiting for colleagues to complete their work. 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. In order to prevent over-processing, 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 is 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 on in the process and to be able to identify the underlying cause, otherwise they could continue to occur. In process handovers are a good opportunity to identify defects at an early stage. This reduces the impact of the asset getting to the end of the process and needing to correct an error.

Another way to eliminate waste is by using "5S". It is a particularly good technique to help improve inprocess activity:

✦ **Sort**

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

✦ **Set**

Arrange items to ensure efficient workflow and to eliminate time taken 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, use of electronic version controlled work instructions.)

✦ **Sustain**

Ensure that improvements are embedded in standard procedure so that they aren't 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 be damaging as it harms employee relationships and will not necessarily prevent the defect from reoccurring in the future. In order to identify the true causes behind a defect, it is important to involve those involved in order to utilise their expertise and get their buy-in to implementing any changes.

✦ **Cause & Effect² Analysis**

This is a useful tool to identify all possibly causal factors which could have contributed to a defect occurring. This helps to prevent individuals from jumping to one particular cause without considering other possibilities first.

✦ **5-Whys?**

This is a useful technique to apply once the cause and effect analysis has been done. It helps to identify the true root causes, which is important if the solution is to be properly embedded within the process to avoid the problem from 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 vote³ (as appropriate).

16.8.4 Evaluate the Outcome

Yield is a useful measure of the process. 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 satisfaction⁴, however it doesn't 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.

² Also commonly known as a fishbone diagram or Ishikawa.

³ 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.

⁴ Assuming that the 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.

