



One Page Summary

Phosphate Sludge Generation Reduction



Name of the Project: Phosphate Sludge (hazardous waste) generation reduction in Cabin pre-treatment line
Name of the Organization hosting the project: Ashok Leyland Ltd. (India)
UN Sustainability Development Goal affected: Goal 12: Responsible Consumption and Production

Introduction:

In Commercial Vehicle manufacturing, painting is one of the important process which generates sludge (hazardous waste). At Ashok Leyland, we comply with all transportation and disposal rules related to the waste management standard (prevalent in the country). While adhering to compliances, being a responsible organization, we are continually innovating to reduce waste generation. One such project at our Hosur-2 plant is explained here.

Essence of the project and Problem statement:

In its regulation, State has given the authorized limit for waste generation which is 300MT/annum for paint sludge and 24 MT/annum for phosphate sludge. At Hosur plant, Paint sludge generation was well within the authorized limit whereas, Phosphate sludge generation (Hazardous Waste) was a concern nearing to the authorized limit. Going forward, there was a risk to cross this limit as production volumes were predicted to be higher by 20% in FY20. Project has been started with the objective of reducing Mean Phosphate sludge generation from 6.92 g/sq.m to 4 g/sq.m.

Methodology used:

Observation and Analysis :

We performed Measurement system analysis (MSA) for titration checking method (Phosphate sludge measurement process) to verify whether the measurement system is capable. Results suggests that the measurement system is capable as Gage R&R is 0.66% and No. of distinct categories (NDC) are 214 i.e. project metric data is accurate & precise.

Nine probable causes are identified for high phosphate sludge generation. Detailed cause validation reveals that moisture content present in Phosphate sludge is very high (61% of sludge weight).

Improve (Finding, Implementing the solutions with resource used):

- To address this issue of high moisture content in Phosphate sludge, drying bed is installed, and drying process is continued. As a result, Mean Phosphate sludge generation reduced from 6.92 g/sq.m to 5.22 g/sq.m.
- Even with improved performance, projected annual sludge generation level will be 26 MT against the Govt. regulation of 24 MT considering 20% higher production volumes.

To further reduce sludge generation, we went for an innovative solution of using less coating weight, which was possible with usage of a different 'Pre-treatment Chemical'. From our research, 'compact & fine phosphate coating chemical' was found most suitable for this process. After implementation, Mean Phosphate sludge generation is reduced to 4 g/sq.m. With this, estimated annual sludge generation will be 20 MT against the Govt. regulation of 24 MT even for 20% higher production volume.

As part of risk analysis, we checked if there's any adverse impact on Consequential metric (Phosphate coating weight). Phosphate coating weight process is stable and capable as Ppk is 1.83.

Results and Effects (few):

- Mean Phosphate sludge generation reduced from 6.92 g/sq.m to 4 g/sq.m
- Phosphate coating weight process is stable and capable as Ppk is 1.83.
- Phosphating process time reduced from 90 sec. to 60 sec. Productivity improved by 12%.
- DM water requirement reduced from 180 KL to 120 KL per annum.
- Financial benefit of INR 5.25 Million.
- Reduction of carbon footprint because of energy consumption reduction.

Resources used: Expenditure of INR 0.1 Million for Phosphate sludge drying bed construction.

Locking & Cloning the Improvements: Operation controls procedures are changed, and training has been given to all associated members. Detailed case study is shared and communicated to **all plants of Ashok Leyland**.

Tools used in the project: Variable MSA (GRR study), Pugh matrix, Test of Hypothesis (2 sample t-test), Process capability studies, Variable Control charts, Risk analysis.

Source	StdDev (SD)	Study Var (6 * SD)	%Study Var (%SV)
Total Gage R&R	0.0765	0.4588	0.66
Repeatability	0.0591	0.3544	0.51
Reproducibility	0.0486	0.2914	0.42
Part-To-Part	11.6405	69.8429	100.00
Total Variation	11.6407	69.8444	100.00

Number of Distinct Categories = 214

