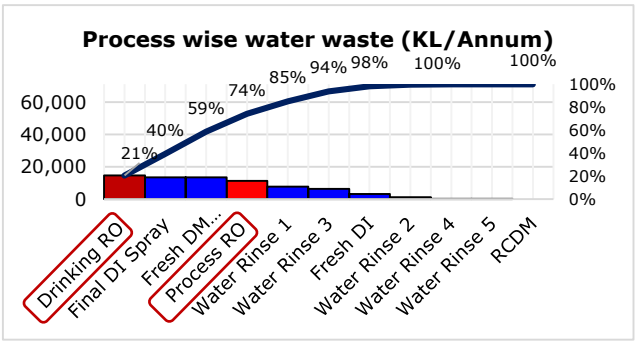
One Page Summary
Water Consumption reduction

Name of the project: Water consumption reduction at Paint shop to achieve 'Water Positive' status
Name of the organization hosting the project: Ashok Leyland Ltd. (India)
UN sustainability development goal affected: Goal 6: Clean Water and Sanitation

Introduction:
One of our largest plant that produces nearly 48% of overall production is situated in water stressed area Hosur (Near Bengaluru). Water is used for process, drinking and gardening purpose in the plant and having the consumption of 285.2 KL/day in normal production.

Essence of project and Problem statement
Out of overall plant consumption of 285.2 KL/day, Cabin Paint shop was the largest contributor (83.5%). Project was started in Cabin Paint shop to reduce water consumption from 894 L/cabin to 600 L/Cabin (33% reduction) which is also in line with our organization's environmental policy.



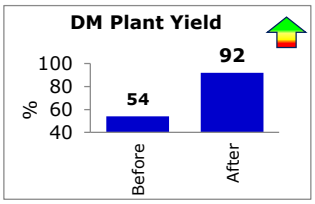
Methodology
Six Sigma DMAIC steps are used to reduce water consumption in paint shop

Observation and Analysis
In the starting of project, sub process wise analysis is done based on theoretical consumption suggested by paint supplier and we observed that we are already at lower consumption (60%) because of past improvements. Sub-process wise pareto analysis is done for water consumption and found that only the water from 3 sub-processes are being reused which is only 21%, while the water coming out from 8 sub-processes is not re-used.

Water coming out from sub-processes like Drinking RO plant water, Process RO plant, Final DI spray, Water rinse cycles etc. is going in waste. So, scope is there for 3R (Reduce, Recycle and Reuse) in these 8 sub processes. But the challenge is to contain water conductivity within 2 micro-siemens (µS)/cm

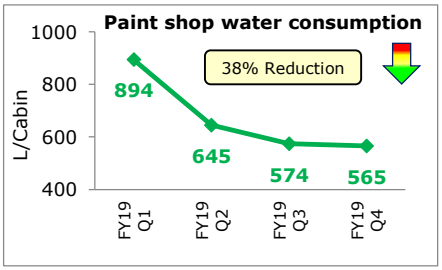
Going further, 6 subprocesses were dropped after detailed analysis of water hardness and turbidity. Water coming out of rinses is either turbid or having hardness of 400-500 ppm. Only 2 processes 'Process RO' and 'Drinking RO' are selected for further improvements.

Improve (Finding, Implementing the solutions with resource used):
1. Drinking RO Plant water: After evaluating multiple solutions, reusing reject water from drinking RO plant for Process RO is finalised and implemented with the minor investment of INR 0.05 Million. This solution resulted in reduction of water consumption from 894L/cabin to 707L/cabin with immediate effect.



2. Process RO Plant water: Currently, DM plant (150KL/day) and RO Plant (192KL/day) are used to produce demineralised water but DM plant is wasting only 20% water compared to 40% at RO plant. As a solution 'Usage of DM plant' is prioritized after evaluation but it was having few risks and concern like capacity and quality. After doing part wise capacity analysis, 'Anion Bed' was found bottle-neck. To counter the same, vessel size has been increased from 700L to 1100L with investment of INR 0.23 Million only. With this improvement, DM water yield also increased from 54% to 92%

Results and Effects:
With all these efforts, average water consumption in paint shop is brought down from 894 (FY19Q1) to a level of 565 L/cabin (38% reduction) with Annual financial savings of INR 1 million.



DM water quality (conductivity) is brought within specification limit of 2 µS/cm. Mean conductivity of DM water after improvement (1.16 µs/cm) is same as before (1.04 µs/cm). Process capability (Ppk) of DM water conductivity has improved from 1.91 to 2. 48

Overall Impact:
a) Ashok Leyland becomes 'Water Positive' for the year FY18 and the trend continued till date.
b) Water intake for FY18 was 1.52 Trillion litres whereas, Water recharge was 3.42 Trillion litres. We recharged TWICE that of water intake!

Locking and Cloning the Improvements: DM water conductivity is taken up as Daily management KPI and being monitored. All standards like Operation Controls, Procedures and Drawings were changed. Detailed analysis and case study are shared with all the plants of Ashok Leyland and projects are being done to conserve water.

Problem solving tools used in the project: Test of Hypothesis (1 sample t-test, 2 sample t-test, Standard deviation test), Process capability studies, Variable Control charts, Pareto, Solution selection matrix, Cost benefit analysis, Box plot, Risk analysis.