

# Six Sigma Helps The Environment: Waste Water Contaminant Reduced 98.8%

## The Opportunity

A large chemical company needed to improve the ability of the toxicity characteristic (TC) stripper to remove an organic material from the waste water stream on-site. Levels were such that there was concern the company would not meet the upcoming EPA permit level of 10 parts per million. One bad batch was occurring on average every day. Also, the TC stripper was struggling to keep up with production. The TC stripper involves a continuous process of feeding waste and steam into a column and taking out waste from the top and water at the bottom. The water is stored in tanks where lab analysis is completed prior to release.

## The Approach

A team was formed. Everyone in the group had received training in the basic process improvement tools, and most members had training in more advanced analysis methods. A consultant served as an advisor.

## The Test

The team used the Scientific Method for Systematic Innovation, including the powerful design of experiments methodology. The team brainstormed 58 ideas for improvement and then narrowed the list down to those ideas that were quick, easy, and inexpensive to use. The goal of the project was to decrease organic levels in the waste water.

<i>Ideas</i>	<i>Old</i>	<i>New</i>
Feed Rate (gpm)	40	20
Steam Rate	650	950
Inhibitor Type	A	B
Brine Temperature	40	75
Decanter Pumpout Speed	500	200
Separator Level	15%	50%
Stripper Level	20%	40%
Cooling Tower Water Flow	Low	High

## The Results

Organic concentration in waste water decreased 98.8% from 42 ppm to .5 ppm (dramatically exceeding the EPA standard of 10 ppm). Best of all, it was done with no capital expenditures and no increase in cost! The stripper capacity increased 200%, so the company could avoid investment for a new waste treatment facility, and potential savings are estimated at \$450,000 per year. The mean time to failure in meeting EPA levels used to be once every day, but it is now once every 10<sup>20</sup> years!

Everyone on the team thought that the feed rate would affect the organic concentration, but they were surprised to find out it had no significant effect and that steam rate had a large effect that the team did not understand. Additional experiments were run with higher steam rates yielding similar results. Finally, an experiment was done with internal temperature and steam rate which showed that internal temperature varied with steam rate and higher temperatures really caused the organic decrease.