

P2 Internship 2006

C.I.L. Inc. – Lawrence, MA

Waste Reduction and Lean Manufacturing in Metal Finishing

Dmitri Tsentelovich, a UNH student, spent the summer of 2006 working on a pollution prevention project with C.I.L. Inc., which is a metal finishing plant. This company offers a variety of processes that produce large amounts of waste including plating shop anodizing, electroplating, passivation and painting services.

Dmitri worked with Laboratory Manager George Abelli in a pollution prevention project entitled "Waste Reduction and Lean Manufacturing in Metal Finishing". The processes that Dmitri focused on were sulfuric/boric Acid Anodizing (BSAA), lean electroplating, acetone reduction, converting to HVLP spray guns and nickel acetate/electroless bath life extension.



Projects	Time it took to Achieve Results	Results
Sulfuric/Boric Acid Anodizing	When process is more efficient	
Lean Electroplating	Needs more attention to design best line	Less time on changing chemicals
Reduce Acetone	Immediate	Saved \$20,000 a year
High Volume Low Pressure Guns	Immediate	Saved \$15,000-28,000 a year
Electroless Nickel Plating/Nickel Acetate Baths	Future	Several thousand dollars once the process is in place

The purpose of the sulfuric/boric acid anodizing was to reduce the amount of chromium that was used in the system. Also, the company was out of compliance with OSHA's new PEL airborne chromium regulations. The approach was to test the economic efficiency of the new BSAA process vs. the old CAA process. It was found that the waste treatment for BSAA was cost effective but the actual process and equipment costs were insufficient to replace the CAA in C.I.L. This procedure was beneficial in that it showed that C.I.L. was using the most effective and efficient process for its metal finishing for their company at this time.

The second project, lean electroplating, was to redesign the line so each process would be isolated meaning the baths would be drained less frequently. Each chemical process would have its own dragout and flowing tanks. There was a large amount of new equipment tanks to be purchased but less metal sludge will be produced leading to less highly toxic waste generation. This process also helps to conserve water in that the baths will be changed less frequently. This would also lead to less worker time on

changing out chemicals. Another portion of this project was to send the line operators through lean electroplating education before stepping on the line. This would help to lead to less contamination.

The third project was to reduce the amount of acetone used at the plant. The acetone baths were used to remove paint from masked parts. It was found that over 90 percent of the used acetone could be recovered with distillation equipment. The equipment was quite expensive (\$11,000-\$12,000) but will bring in tremendous savings in the long run to the company. The savings resulting from the reduced purchases of acetone were around \$20,000 a year. Also, Dmitri located a distilling piece of equipment in the factory that could be used to distill acetone; therefore C.I.L. did not have to purchase any new equipment and still saved thousands of dollars a year.

Dmitri suggested that the spray guns be converted to high-volume low-pressure guns (HVLP). This would improve transfer efficiencies that would save on both paint and booth filter use. HVLP implementation was relatively cheap but drastically reduced the waste production. The use of these sprayers saved the company between \$15,000 and \$28,000 annually for the cost of paint alone. The pollution prevention benefits were the reduction in waste paint, paint use, VOCs and reduction of filter changes.

Two other projects that will be utilized in the company's future are extending the life of electroless nickel plating tanks and extending the life of nickel acetate baths. A series of seals, nickel precipitation and electro dialysis techniques will be assessed as to the best management practices for the company.

Freudenberg-NOK General Partnership – Bristol, NH

Boiler Efficiency Project and Waste Generation Reduction Project

Christopher C. Hikel, a UNH student, spent the summer of 2006 working on a pollution prevention project with Freudenberg-NOK General Partnership. The objectives of this project were to understand the current state of operational cost and efficiencies of the boiler system, and to focus on the reduction of the generated waste in the plant. Chris worked with plant manager Dean Laughy and titled the project "Boiler Efficiency Project and Waste Generation Reduction Project".

Upon initial investigation, it was clear that the boiler system in the company was inefficient for its needs. The two existing boilers were not working to their potential. The monthly consumption was 25,186 gallons of oil an hourly rate of 34.5 gallons. The system needed to be reevaluated. The other factor in the equation was the loss of heat from poor insulation. The heat loss difference from non-insulated pipes insulated respectively yielded to savings of \$62,000 a year. Overall, 13 percent energy was saved using the two new boilers and new insulation. To do this Chris used a simple mass balance table to show steam requirements. This showed where insulation was insufficient.

The second project that Chris worked on was to identify the hazardous waste and how to eliminate or reduce the amount being sent out for disposal. The disposable waste identified was oil and rinse water. The waste oil was reconfigured to be cleaned on-site and reclaimed for energy use. The oil needed was reduced by 70 percent and the metal by-product by 80 percent. The oil was first filtered into two systems and then fed into the boiler from the main fuel tank for recovery of energy. There was approximately 383 gallons of waste oil produced monthly containing approximately 30 percent water. The 268 gallons of remaining oil was used in the boiler and the water was sent to cleaning and is discharged into town water treatment facility. This is a cyclic system that cut out the current cost for disposal, which is around \$85,000 a year. The rinsewater was evaluated and deemed to be a viable area of reduction. There was a closed loop system used that reduced the wastewater by 51 percent. It is now being purified for air compressor cooling tower and make-up water for the boiler system. To see the exact reduction percentage, there needs to be more testing and research.

Overall, Chris saved the company approximately \$150,000 with a few simple efficient pollution prevention changes.

Rohm & Haas Electronic Materials – Marlborough, MA

Study of Pilot Plant Acetone Use Reduction

Stephanie Granger, a UNH student, spent the summer of 2006 working on a pollution prevention project with Rohm & Haas Electronic Materials. The objective of this project was to reduce the amount of acetone used for cleaning within the plant. The majority of the acetone used in the plant is used as a cleaning solvent. Cleanout acetone accounts for 55 percent of acetone used in the plant, which also tends to pick up polymer material, metals and batch solvent. Instead of using fresh acetone for every batch for all vessel cleanouts and qualifications, the acetone should be distilled and reused. After doing a preliminary evaluation, it was found that the overall volume of acetone entering and leaving the pilot plant could be reduced by 51 percent using purified recovered solvent. Bottom line annual savings by distilling the acetone would be 16,137 kg per year and approximately 100 drums, which yields a \$25,500 per year saved.

Sermatech Connecticut – Manchester, CT

Thermal Spray Waste Management and MSDS Database Construction

Andrew Avery, a UNH student, spent the summer of 2006 working on a pollution prevention project with Sermatech Connecticut. The objectives of this project were to create a pollution prevention plan on the thermal spray powder systems and to create an MSDS database for the company. Sermatech has been implementing pollution prevention techniques for quite some time including Kaizen events, recycling, upgrades in heating and cooling systems, and lighting upgrades.

Andrew's first project was to implement pollution prevention on the line. The waste thermal spray powders were to be collected, separated and recycled. This process will be done by an outside source that also will recycle all of the materials. By recycling the metals in the sprayers the company was able to save \$5,750 a year.

The second project was to reduce the time needed for an employee to find MSDS sheets on any and all chemicals needed and produced in the plant. Andrew created a database for the company's intranet that would link all MSDS sheet for the entire company together. He used an identifier that was also linked to the hard copy so that each product would be easily accessible to the user via intranet or on paper. The hard copy of all MSDS sheets were set up in two volumes: one according to archived materials and the other to current materials.