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Major: Chemical Engineering
School: Benedictine College



Company background

The Kansas State University Pollution Prevention Institute's 2023 sustainable materials management (SMM) circuit rider intern assisted four facilities with waste reduction and diversion projects. The facilities operated under four different industrial classifications: treated earth absorbent manufacturing, wood and paper manufacturing, specialty vehicle manufacturing and dairy production.

*Facilities
throughout the
state of Kansas*

Project background

Funded by an EPA Region 7 SMM grant, the internship began with each facility submitting a pre-assessment form highlighting their main waste challenges. The intern then visited each facility to observe their processes, collect data and explore waste reduction and diversion opportunities. Following the visit, the intern provided each facility with a detailed report outlining waste-related recommendations and their potential economic, social and environmental impacts.

Incentives to change

Effective waste reduction and diversion activities can directly lower a facility's procurement and disposal costs as well as indirectly reduce the rate that resources are extracted, processed and transported. Additionally, diverting waste from landfills through reuse, repurposing and recycling programs can shift the economy from a linear "take-make-waste" model into a more sustainable, circular model, where waste is a material to be used continuously and is not just an endpoint.

Each of the four facilities recognized these benefits when seeking assistance. One facility focused on an emissions reduction goal while the other three focused on waste-specific goals. Two facilities in particular requested help in achieving zero waste to landfill status.

PROJECTS REVIEWED FOR SMM POTENTIAL

Clay and limestone dust reuse

One of the facilities sends 252 tons of usable clay dust to the landfill each year due to contamination issues. The intern recommended installing barriers at select locations to reduce contamination. If implemented, this could allow the facility to reuse the clay dust and save \$65,300 annually. This facility also sends 192 tons of limestone dust to the landfill each year because the dust is too fine to use. The intern recommended diverting the limestone dust to nearby businesses that could use it. One business agreed to take at least two tons per year, saving the facility \$350.

Mixed dust reuse

The same facility landfills 443 tons of mixed clay and limestone dust per year due to quality and contamination concerns. The intern recommended verifying if the mixed

dust could be reused if it were not contaminated. If the dust is reusable, then the intern recommended reusing the dust by filtering out the contaminants. This could save the facility \$105,200 per year.

Wood waste

One facility generates 63 tons of wood waste per year in defective cabinet doors. A portion of the facility's wood waste is shredded and recycled as animal bedding, but the defective doors are landfilled because they contain metal components that could contaminate the shredded wood. The intern recommended installing a magnet on the facility's wood shredder to remove metal contaminants, thereby allowing the defective doors to be recycled. This could save the facility \$3,000 per year. The intern identified a nearby waste-to-energy facility that the manufacturer could divert its remaining,

PROJECTS REVIEWED FOR SMM POTENTIAL, CONTINUED

unrecyclable wood wastes to, but more research is needed to determine this activity's impacts.

Glass waste

Two facilities requested assistance on diverting glass waste from landfills. One facility generates 0.6 tons of broken glass bottles per year, and the other facility generates 1.4 tons of broken windshields per year. The intern recommended that the first facility take their broken bottles to a nearby recycler, and the intern recommended that the second facility prevent windshield breakage by improving their windshield packaging design. These projects could save a combined \$9,090 per year.

Excess skim milk

One facility discharges 135 tons of excess skim milk to its wastewater lagoon annually. Skim milk is a strong source of protein and has been successfully used in the agricultural industry to supplement livestock feed. The intern recommended that the facility redirect its excess skim milk to feed its livestock, which could save it \$60,000 per year, conserve 28,000 gallons of water and reduce feed requirements by at least 12 tons annually.

Plastic caps

One facility uses No. 4 plastic caps as part of its product packaging. Consumers frequently return used packaging back to the facility with the plastic caps still attached. The facility discards these caps in the landfill resulting in 0.28 tons of plastic waste per year. The intern recommended recycling this plastic, but further research is needed to identify a recycling company willing to take this waste stream.

Chemical totes and spray cans

One facility receives bulk liquids in IBC totes and accesses these liquids using pumps. However, each pump's inlet pipe is not long enough to reach the bottom of the totes. As a result, the facility ships 14,000 gallons of unused liquids back to its supplier each year. By extending the reach of its pumps, the facility could use these liquids and save \$36,600 per year. The same facility also recycles 100 pounds of metal from single-use spray cans each year. The intern recommended replacing these spray cans with reusable spray cans, which could save the facility \$5,880 per year and eliminate this waste stream.

SUMMARY OF 2023 SMM CIRCUIT RIDER INTERN RECOMMENDATIONS

| Project | Annual estimated environmental impact | Estimated cost savings (\$/year) | Status |
|-------------------------------------|---|----------------------------------|----------------------|
| Clay and limestone dust reuse | 254 tons of mineral, 72.4 MTCO ₂ e | \$65,650 | Recommended |
| Mixed dust reuse | 443 tons of mineral, 69.8 MTCO ₂ e | \$105,200 | More research needed |
| Wood waste | 63 tons of wood, 109.8 MTCO ₂ e | \$3,000 | Recommended |
| Glass waste | 2 tons of glass, 0.98 MTCO ₂ e | \$9,090 | Recommended |
| Excess skim milk | 135 tons of skim milk, 12 tons of feed, 28,000 gal of water, 13.2 MTCO ₂ e | \$60,000 | Recommended |
| Plastic caps | 0.28 tons of plastic, 0.26 MTCO ₂ e | \$0 | More research needed |
| Chemical totes and spray cans | 0.05 tons of metal, 14,000 gal of chemical, -0.22 MTCO ₂ e | \$42,480 | Recommended |
| Total¹ | 466 tons of solid waste 28,000 gal of water 14,000 gal of chemical | \$180,220 | |
| GHG reductions^{1,2} | 182 metric tons CO₂e | | |

¹Does not include projects "not recommended" or where "more research needed."

²EPA P2 GHG Calculator with Cost, 7 April 2016 & EPA WARM Tool—Version 15.1, September 2022