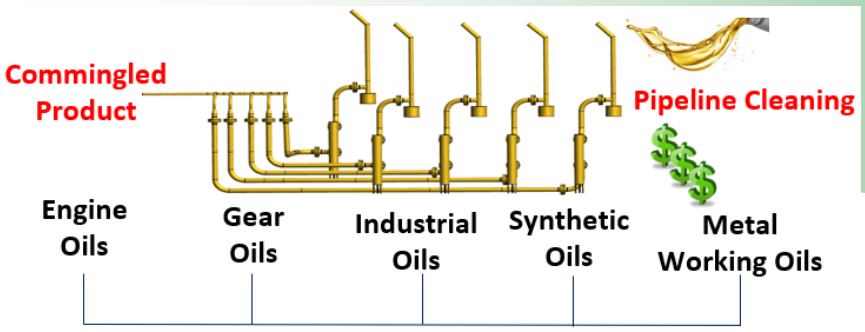
Optimization of Pipeline Flushing and Lube Oil Blending Operations

Rowan University through support from the U.S. Environmental Protection Agency Pollution Prevention Program received a grant to improve cleaning efficiency in multiproduct petroleum pipelines. The proposed solution integrated experimental analysis, process modeling, optimization and management of change to improve operational efficiency by ~**67%**.

Pilot Plant Fabricated at Rowan University



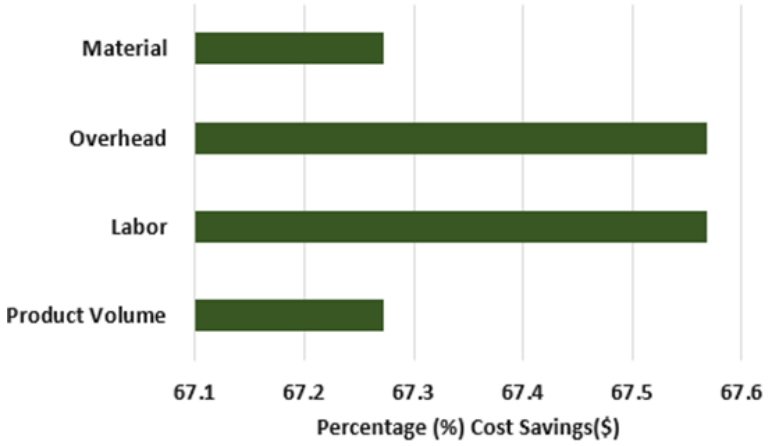
Background

Cleaning of pipelines between product changeovers is crucial for maintaining the product quality and purity in multi-product pipeline systems. Existing cleaning methods are inefficient and lead to formation of low value mixed oils. Our goal is to optimize these cleaning operations and minimize the oil downgrade.

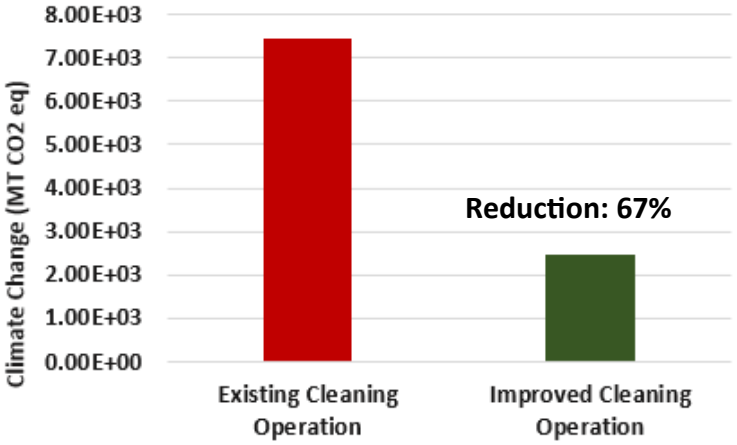
Solution Strategy

- **Operational Review:** Conducted analysis of current pipeline operations to identify areas of improvement
- **Data Analysis**: Explored plant data through statistical analysis for in-depth understanding and insights
- **Alternative Options for Pipeline Cleaning:** Explored several alternatives to improve cleaning operations
- **Feasibility Assessment:** Assessed the drawbacks and practicality of the alternative methods explored
- **Selection of Candidate Solution:** Chose procedural enhancement as the best alternative solution
- **Benchtop Rig Development**: Built a benchtop rig to test the efficacy of the procedural enhancement
- **Management of Change Operations:** Implemented the improved procedure at the plant
- **Pilot Plant Development:** Built a scaled down pilot plant to study additional alternatives for further refining of the pipeline cleaning operations

Estimated Cost Savings*



Environmental Impact Assessment*



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Link to journal and peer-reviewed conference publications:

1. Jerpoth, S. S.; Hesketh, R.; Slater, C. S.; Savelski, M. J.; Yenkie, K. M. Strategic Optimization of the Flushing Operations in Lubricant Manufacturing and Packaging Facilities. *ACS Omega* **2023**, *8* (41), 38288–38300. https://doi.org/10.1021/acsomega.3c04668.
2. Jerpoth, S. S.; Hesketh, R.; Slater, C. S.; Curtis, S.; Fracchiolla, M.; Theuma, D.; Yenkie, K. M.* Hands-on Experience in Solving Real-World Problems via a Unique Student-Faculty-Industry Collaboration Program. 2023 ASEE Annual Conference, Baltimore, MD. https://strategy.asee.org/43334
3. Jerpoth, S.S.; Hesketh, R.P.; Slater, C. S.; Savelski, M.J.; McClernan, R.; Yenkie, K.M. Application of Discretized Non-Linear Programming to Minimize Mixed Oil Formation in Flushing Operations of Lubricant Pipelines. Proceedings of the *Foundations of Computer-Aided Process Operations and Chemical Process Control (FOCAPO/CPC)*, 2023
4. Jerpoth, S.S.; Hesketh, R.P.; Slater, C. S.; Savelski, M.J.; Yenkie, K.M. Computational Modeling of Lube-Oil Flows in Pipelines to Study the Efficacy of Flushing Operations. Proceedings of the 14th International Symposium on Process Systems Engineering (PSE), 2022.

*Based on Projected Operations

Link to standard operation procedure (SOP) for improved cleaning GitHub: https://github.com/kmygroup/EPA_P2_Optimization-of-Pipeline-Processes