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Bulk Tank Allocation Project Leads to Improved Asset Utilization

Faced with a challenging resource allocation project, researchers at the Center for Excellence in Logistics and Distribution (CELDi) at Virginia Tech, in collaboration with personnel at Air Liquide, developed a Bulk Tank Allocation (BTA) tool to reallocate resources and reduce annualized tank investment and distribution costs. This CELDi project targeted increased productivity with bottom-line impact.

An important strategic level decision in the industrial gas industry involves the allocation of bulk gas tanks to customer sites. This project generated a novel approach for resource allocation that analyzes strategic level decisions while incorporating operational-level characteristics. The approach leads to improved distribution efficiency and reduced costs.

For a set of customers having specified demands, the bulk tank allocation problem determines the preferred size of bulk tanks to assign to customer sites in order to minimize tank investment costs and gas distribution costs for the industrial gas distributor. The problem is

An Air Liquide bulk tank. The bulk tank allocation problem determines the preferred size of bulk tanks to assign to customer sites in order to minimize tank investment costs and gas distribution costs for the industrial gas distributor.

modeled as a mixed-integer program and then solved using a decomposition approach. A heuristic method for clustering customers and developing routes is proposed based on a sweep algorithm. These potential routes serve as input for the bulk tank allocation problem, which selects routes and assigns tanks to customer sites.

Economic Impact: Before the development of the BTA tool, bulk tank decisions were often made for individual customers, without the ability to consider interactions with other customers. The BTA tool now allows for the interrelationships between customers to be considered when allocating tanks, providing a system level assessment. The distribution cost savings are also provided at

the system level. The BTA tool has been evaluated using data from Air Liquide to demonstrate the improved efficiency of gas distribution. The tool is currently being deployed as part of the strategic planning system at Air Liquide. The results of this project have appeared in two conference presentations, a journal publication, and the Air Liquide annual report.

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