BP Hydrocracker Elbow Handling Conceptual Design

Project Background

The BP Cherry Point Refinery has requested that Washington State University Senior Design Clinic study and develop a process for removing and reinstalling the bottom reactor elbows from their Hydrocracker units. These elbows weigh in excess of 7,000 lbs and due to the confined nature of the vessel skirts, pose significant and unique challenges to BP contractors during removal. The current process requires complicated rigging and many man-hours to complete. The goal of our design is a safer and more streamlined method for completing this task.

The key design elements require all personnel to be clear of the skirts while the bottom elbows are in motion. A specific emphasis on safety and environmental protection will be placed on all design decisions. It is the shared philosophy of BP and our design team that a safer process will also result in a faster and more efficient process.

The Solution

A system of carts and rails, hydraulic rams, and motorized turntables has been designed to meet the project needs. The direct manipulation of the pipe will be done by the Lifting Cart. The Lifting Cart is comprised of two set of hydraulic rams mounted to a steel chassis. The Lifting Cart rides atop the Double Rail System, rotating the Lifting Cart from the access opening to inline with the elbow. Once outside the skirt, the Lifting Cart will be secured to the Transport Cart. Both carts and the elbow will be rolled to a nearby loading zone, out from under the Hydrocracker scaffolding. This design will safely allow maintenance personnel to remove/install the Reactor Elbows without the need for any personnel to be inside the confined skirt area during the moving of the pipe.

Project Team

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