Chapter One

Introduction

1.1   Overview

Filtration plays a major role in improving the diesel quality. Filtration protects the fixed-bed catalyst reactor form the most common contamination problems, including solids, and liquids originating from the upstream equipments, storage tanks and pipes.

Contaminants can foul the reactor beds resulting in higher differential pressure that leads to reduction in recycle hydrogen compressor performance. Contamination fouling can also cause (cooking), which is a catalyst deactivation, requiring refiners to raise temperatures in the reactor, to compensate. Furthermore, contamination in hydrotreater feed streams will result in problems in the heat exchangers and hydrogen compressors leading to downtime and expensive repairs. The diesel oil Backwash Filter is a protection device of hydrogenization and catalyst reactor in the (DHT) Diesel Hydro treated Unit. The Backwash Filter removes deposit, sludge and sediments from the diesel oil coming from the tank, and prevents it all from entering, and clogging the catalyst beds; this protection extends the reactor run times and results in maximizing the heat transfer in the preheated &furnace. Multiple banks of filter elements with valves at the inlet and outlet of each bank forms up the Backwash Filter; banks run in parallel, and each bank handles a portion of the process. Unfiltered diesel enters each bank via the inlet and is distributed evenly to each filter housing. The diesel flows from the outer side of the element to the inner side, depositing contaminants on the outer side. Clean diesel exits banks via the outlets. The Backwash Filter

is controlled via a pneumatic control system, as contaminants collect on the filter elements, the pressure differential across the filter increases, and when the pressure differential reaches a controlled set point across the filter, a pressure transmitter signals a solenoid valve which sends a pneumatic start signal to the quick stepper pneumatic controller to begin the backwash cycle. The Backwash system is cleaned using the filtered diesel. Only one pair of elements is cycled during backwashing process, while others elements are in filtration mode such that the system operates without interruption. After the whole system has been backwashed, the cleaning process is automatically reset until differential pressure rising initiates a new signal.

1.2   Problem Statement

The main problem can be identified as the lack of a proper controlling and monitoring system, so in case of valves failure to close, the system loses a considerable amount of diesel. On the other hand, when the valves fail to open, a huge amount of solids and particles enter and build up in the beds and eventually reduce the efficiency of the catalyst. Moreover it is very difficult to track pneumatic signals and most of the problem solved by replacing pneumatics parts which increase the maintenance cost and downtime.

1.3   Proposed Solution

The pneumatic control system of the backwash filter will be replaced, programmed, configured, and integrated in Foxboro distributed control system (DCS). Six solenoid valves and six proximity switch will be added.

1.4 Objectives

- To improve the reliability and stability of the BWF operation by designing a proper monitoring and controlling system.

- To minimize maintenance and spare part cost by replacing the whole pneumatic system by a program, solenoids and proximity switches.

- To extend catalyst service life by making sure all contaminates removed through the proper monitoring and controlling system.

- To Increase the diesel yield by accurately controlling and monitoring the valve opening and closing.

1.5 Methodology

The research will employ 'Virtual Foxboro DCS machine packages for creating and simulating the control strategy, graphics, phase plate, alarm, and the trend. The Integrated Control Configurator (**ICC**) package will be used for creating and configuring function blocks (Control Strategy), and the **Foxdraw** software package will be used for drawing and linking the Graphics, in addition to the **Foxview** and **Foxselect** will be used for monitoring and simulating the control system

1.6 Research Layout

The   research consist of Six chapters, **Chapter one** give and Introduction for backwashing filter, problem statement, proposed solution, objective and the project methodology. **Chapter Two** is the Lecturer Review. **Chapter Three** provide some details about the Foxboro DCS system (ICC, Fox View, and Alarm). **Chapter Four** give is about the System design and Control, **Chapter Five** covers the Simulation and Results achieved, and **Chapter Six** gives a Conclusion for the research and List all the Recommendations.