Retrofit propane for monitoring production process in C3 splitter in a private company in Indonesia

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Abstract. In propylene products, there is still a small proportion of propane which still the impurity of the propylene. Therefore, a tool for monitoring is needed while controlling the content of impurities (propane) so that the propane content in propylene is within the permissible tolerance, a maximum of 0.4 vol%. The tool that can be used to analyze the propane content in propylene is the Online Propane which works continuously for 24 hours. Need to installation of the Online Propane. However, the installed propane often fails (downtime) caused by the inability of the oven (heater) to maintain the temperatures stability in the column at a temperature of 60 °C, so that the column is unable to separate the propylene components mixed with propane properly. Frequent down time on the causes the installed propane to be poor and unreliable. The value of reliability tests with existing data is only 60.51%, under the IEEE 1336-2000 standard. it is important to do a retrofit to improve the s performance in maintaining the quality of propylene according to the design, to facilitate the operator in monitoring the process and to facilitate technicians in performing preventive maintenance.

1. Introduction
In the oil and gas processing industry, product quality takes precedence. To guarantee the quality of products in the world of oil and gas according to the design, in processing a product there needs to be a reliable control system that can control the process so that it is able to produce product quality perfectly, is safe for the environment, and can work continuously. One of the tools used to provide the feedback system is the Online Gas Chromatograph, the Online Gas Chromatograph function to analyze gas composition.

As an analysis tool, the online gas chromatograph functions to analyze the composition and calculate the concentration of components of a product and is used to control product quality, so that it is expected to produce the perfect product in accordance with the desired specifications is usually used in the oil industry, petrochemicals and chemical plants [1]. The online installation of a gas chromatograph make the quality fluctuation of the product can be maintained because the can directly send data from the analysis results continuously for 24 hours. Data sent in the form of a standard signal sent to the control room for used as an indication and control input [2]. So that the operator can know quickly whether the product has met the desired specifications or not, without waiting for the results of analysis from the laboratory is one of the equipment of a control system that works in conjunction with Level, Flow, Temperature, Pressure and other control devices. The analysis results from the Online Gas Chromatograph will be compared with the results of laboratory analysis, so that measurement errors can
be known [3]. With this it is expected that operational reliability in terms of both production continuity and product consistency that meets the desired specifications can be maintained.

2. Method
In the analysis process, the online propane 19-AT-001 will output a 4-20 mA signal and displays a graphic image in the form of a peak image on the chromatogram in the panel down. This output is the end of the process of measuring the sample into a signal that states the composition and concentration of the components as measured. Output in the form of 4-20 mA signal is sent to DCS as an indication and controller input 19-AIC-001 [2]. This output is sent periodically by every 210 seconds for 24 hours. The measurement results from the online propane will be compared with the results of laboratory gas chromatography analysis. Laboratory analysis will state the concentration of propylene in vol% units, while the online propane results will state the concentration of propane in vol% units. Because propane installed in the field often experience downtime, laboratory analysis is the only analysis to determine sample content. When testing the sampling is done three times a day. The test method used to test propane refers to ASTM D-2163 and the test duration is 25 minutes. Analysis of sample content to measure propane / propylene content is carried out qualitatively and quantitatively.

Qualitative analysis is a method for identifying chemical components in a sample. The chromatographic parameter used in qualitative analysis is retention time. The retention time of the components in the sample can identify the component if there are references or standards. Column variables used in the analysis are kept constant, which is length column, mobile phase, pressure, temperature, and flow rate of the transporting gas. The retention time standard used refers to the ASTM D-2631 standard [4].

Quantitative analysis is a method that involves estimating or measuring the concentration or weight of one or more components in a sample [5]. The detector in gas chromatography produces a signal which is translated by recorder in the form of a peak that has area. The basis of this quantitative analysis calculation is the comparison between the peak area and the mass of the eluted component.

3. Results
Chromatography is a way to separate a gas mixture which is complex into each of its constituent components. Principle of separation in gas chromatography is the distribution of components to be separated between two phases, namely the stationary phase and the mobile phase [6]. The stationary phase is solid packing) which is superimposed on the column wall, while the mobile phase is in the form of gas carrier (carrier gas). The components to be separated are brought through a column with an inert carrier gas. The components to be separated undergo partitioning between gases carriers and solids of the stationary phase. The solid will selectively to separate components from the sample into pure components according to the molecular weight and boiling point of the component so it will produce differences in the speed of each component. In carrying out retrofitting, the following steps must be considered:

3.1. P&ID propane design 19-AT-001
This P&ID diagram contains several control loops related to the 19-AT-001 propane analyser process. Starting from the sensing element to the controller and final its elements. P&ID facilitates the work of instrument engineers and other engineers in maintaining or modifying a system. From P&ID it can also be determined which control system will be applied, because P&ID is interrelated with the process flow diagram (PFD) of a plant [7,8].

3.2. Design of propane analyser in accordance with specifications
There is a problem in the propane analyser applied instrument technology FXI series 5 which has a scarcity of spare parts, it is necessary to change the analyser on the C3 Splitter. Based on the specification data above, we can determine the appropriate propane analyser model with the process that
we need. propane analyser suitable for retrofitting purposes is the Online released by Applied Instrument Technologies FXI Series 7 [9].

3.3. Propane analyser AIT FXI Series 7
Applied Instrument Technologies FXI Series 7 was chosen as an analyser in this retrofit because PT XY for the past 20 years has used the longest series of AIT namely Applied Instrument Technologies FXI Series 5 [10]. Some reasons for choosing AIT FXI Series 7 due to this analyser able to connect to a variety of DCS systems so that they are more flexible and capable integrating the HMI, designed to simplify operational settings and functions so as to facilitate the operator in monitoring and operate the analyser. After retrofitting, it is expected that the propane analyser can maintain the quality of propylene in accordance with the specified design and help the operator's task in easily monitoring the process.

3.4. Design sample probe
A sample probe is a continuous device withdraw or take liquid propylene samples from 19-C-102. In tray 11 with a pressure of 15.3 kg / cm² and a temperature of 28 °C. Samples will be forwarded to the through sample transportation tubing. This sample probe has a length of 350 mm that goes into the side downstream hole and has a flange with a rating of 150 types of RF. The sample probe is mounted vertically from the line mounted horizontally, and is stamped on the flange. The sample assembly is installed in the middle hole of the process pipe and the flat circular disc welding to the end of the pipe and the bottom hole so that it can intersect with the plate. The sample probe will pull the propylene sample from the 6 mm hole with a steel stainless steel pipe and pass it through the globe valve ¾ inch to the sampling system and process it into the. In carrying out this retrofit, the propane still uses the design and application of the pre-installed sample probe.

3.5. Sampling system design
Sampling system is a device that functions to draw samples from 19-C-102 and return the samples to 19-C-102, then reduce the pressure from pressure of 11.2 kg / cm² to 1 kg / cm², and changing the sample from the liquid phase to the gas phase. The sampling system and circulation pump are designed to be able circulate the sample until it returns to C3 splitter back in a maximum of 30 seconds so the piping design must be made as simple as possible and must avoid complicated systems. Sampling system consists of sample circulating pump, control valve, flow meter regulator, filter and temperature gauges and all components must consist of stainless steel according to AISI (American Iron & Steel Institution) standards. The sample transportation tubing in the sampling system is a stainless steel pipe with AISI 316 standards and equipped with pressurized fittings. To minimize leakage, each connection must comply with the ANSI 82T NPT standard to avoid minimum leakage [8,11].

3.6. Analyser housing design
The design for the installation location of the analyzer must take into account several criteria such as the layout and size of the housing, here are some criteria that must be considered in designing the analyzer Housing:

- Analyser and several other tools must be placed based on economical design, have easy access for maintenance and there is room for the trail.
- All analysers must be placed in such a way that is easy for routine maintenance and inspection of the equipment without having to disassemble the equipment.
- The gas carrier and calibration gas cylinders must be placed outside the walls and protective roof. analyser Housing on the propane is white with a black floor. The analyser housing is made of steel construction with a jagged roof and has a sideways slope of 25. The shelter is fitted with a removable canopy from the side and overlaps between the roof and canopy must be sealed. Canopies are also installed above the door and need to be equipped with pvc gutters to connect pipes down on each side of the shelter. Analyser Housing consists of two doors with a width of 940 mm x height 2000 mm with a lock on the outside. The door must have glass with a diameter
of 6 mm along with the name of the analyser installed in the housing. The Housing Analyser is equipped with a fan that is able to circulate a maximum air flow of 15 m / s. The fan must be removable so that it can be easily repaired and located outside the room. The shelter is equipped with air conditioning to keep the temperature inside the shelter at 28 °C even though the ambient temperature has reached above 28 °C. In addition, the air conditioner will also pay attention to heat emissions from the, oven heater and solar radiation directly.

4. Conclusion
The existing propane analyser (old) is in poor condition and is not reliable anymore because the calculation of the reliability value is only 60.51%. This value is below the minimum reliability standards issued by IEEE 1336-2000, which is 75% of the condition of the equipment, so a retrofit propane analyser is needed.

Retrofit propane analyser is able to maintain operational reliability in terms of continuity and product consistency according to the desired specifications and can reduce the possibility of loss indirectly caused by the old down time analyser.

It is expected that after retrofit propane analyzer 19-AT-001 can maintain the reliability of the analyzer operation and to be predictive and preventive maintenance, and periodic calibration.

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