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Tug Boats Fuel Efficiency with use of Flow meter Web Based Monitoring and Control System in P.T. X

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Abstract. In order to increase efficiency, a monitoring system has been measuring operational performance existing. After a system created and used, management can measure performance to improve the efficiency. With all information that has been collected, management will be able to produce a decision accurately and increase productivity and efficiency operational. P.T. X has implemented the installation of flow meters in all ships and has been examined in previous research. It is continued deeper by applying the use of flow meters using web-based as a sensor long-distance, as to be monitored anytime and anywhere using a sensor equipment named eGenKit. For that, the study is conducted in order to assess the use of fuel efficiency on tug boats using web-based monitoring and controlling system in P.T. X.

1. Introduction

All the measurement of the flow of fuel is very important in management process of fuel in a ship. An instrument for measuring the flow called flow meter. This device serves determined to measure how much consumed during continuous ship operation. Fluid referred to fuel oil in a ship. The measurement of fuel intended for energy efficiency to manage and control the use of energy in their company. At the sea, energy sources for fuel must be managed, controlled and made more efficient. The cost of fuel is expenditure largest indispensable both on shipboard and in a building. Factors that have brought inefficiency fuel is: wrong design for ship (for example like the calculation size of propeller, machine, and others), a lack of competence crew especially that associated with operation and management, the theft of the fuel, and the quickness supervisory to support operational especially times in dealing with the problems. In order to increase efficiency, a monitoring system is used for measuring operational performance existing. After a system created and used, usually management can measure performance and take action anything to improve the efficiency. With all the information that has been collected, management is able to produce a decision accurately to increase productivity and efficiency operational.

P.T. X has implemented the flow meters in all ships and has been examined in the previous research. From the previous research [3] P.T. X group is a company that moves in information technology, resources, energy, mining logistic & services. P.T. X group owned company shareholder in systems integration, ranging from Information Technology business process outsourcing/employment, services logistician/carting, business oil and coal mining. One of subsidiary of P.T. X is company services provided sea transportation that focuses on sea transportation including a barge intensity and ship for



transporting coal, ranging from dredging, loading-unloading until transporting. One large project of that company has established cooperation with the government for transporting coal to nuclear power plant (PLN) in Pelabuhan Ratu, West Java.

P.T. X has some tug boats, a small vessel assigned to pull or push larger vessels in port. Besides that, the tug also serves to draw barges contains coal coming from treatment coal plant to be brought to the port place then carried out to the trucks. Now the research is conducted much deeper applying the use of flowmeters using the internet use web based as a sensor remotely to be monitored anytime and anywhere using a sensor equipment named eGenKit. That is why the study is conducted to assess the fuel efficiency on tug boat using executive web-based monitoring and control system in P.T. X.

2. Problem Identification

The problems faced by P.T. X is:

- How to select the type of flowmeter which is suitable for tug boat 2060 HP, in this case there are two tug boats i.e. tug boat Titan 21 and Titan 23, with great vary fluctuations rpm machine;
- How to install and implicates the system and synchronize it with the existing fuel system;
- How to monitor or analyze the use of flow meter with the objectives of installment the use of fuel in a ship.

In this research, P.T. X developed the installation of flow meter with use of the web-based sensors that can be controlled the use of fuel anywhere and anytime by using eGenKit. Sensors set to be fitted in each of the ship are:

- Fuel Consumption sensors 2 pieces those in the in-let and out-let, type sensors fuel-consumption is flow meters corilois owns by the Emerson, size 1/4 inch;
- Bunker sensor 1 pieces to be installed in a pipe filling-bunker, type sensors bunker is flow-meter corilois owns by the Emerson, size 3 inch;
- Rpm sensors 4 pieces, 2 in play engine (Main Engine) and 2 in Generator Set (Auxiliary Engine).

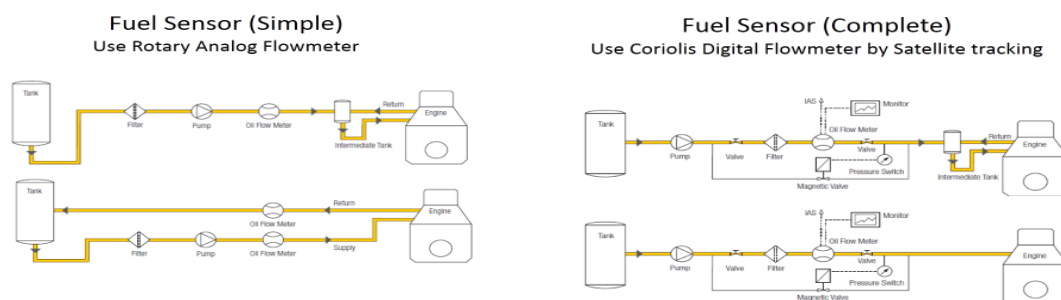


Figure 1. Flow meter Diagram Analog and Digital System

Types of flow meter [2]: ultrasonic flow meter, glass tube flow meter, turbine flow meter, electromagnetic flow meter, orifice flow meter. And the type fuel oil flow meter was the sub of glass tube flow meter is shown in Figure. 2.



Figure 2. Fuel Oil Flow meter Types

Flow meter discussed is the type rotary analog Aquametro brands [1] and type digital corilois Emerson brands. Flow meter type rotary analog Aqua metro brands used only on system discharging fuel and not to be used on system filling bunker. The use of satellite system is to report online flow meter type digital Coriolis Emerson brands on system discharging fuel and a filling bunker system.

3. Result and Discussion

3.1 Research Location

The object previous studies located on the island of Batam to the construction of ships that uses eGenKit. There are two ships i.e. tug boat Titan 21 and 23. After that observation and data processing brought from location where the tug boat sailing between port from Pelabuhan Ratu to Kotabani, Bengkulu.

Loss of Steaming Time



Figure 3. Sailing between port Pelabuhan Ratu-Kotabani, Bengkulu

Table 1. History of Fuel Consumption per trip [4]

History of Fuel Consumption Per-trip 2011 - 2015		
Apr 2011 - Dec 2011	41.650	Liters
Jan 2012 - Dec 2012	39.150	Liters
Jan 2013 - May 2014	36.650	Liters
Jun 2014 - April 2015	34.150	Liters
May 2015 - End	31.650	Liters
Target-1	29.150	Liters
Target-2	26.650	Liters

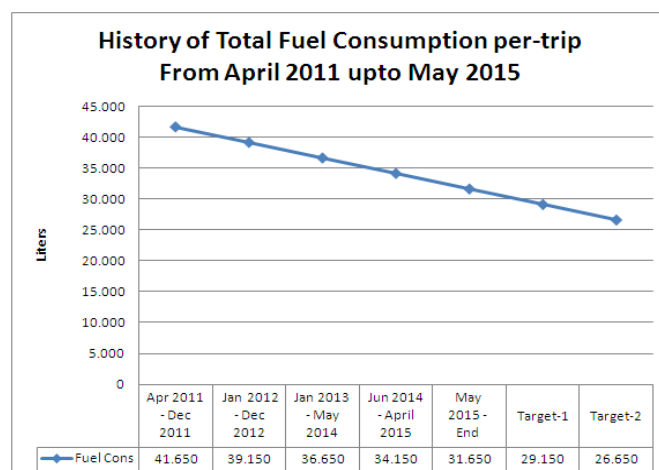


Figure 4. History of Fuel Oil Consumption per trip

Table 2. All the Ship Fuel Oil Consumption [4]

Fuel Oil Consumption			
Name of the Ship	Actual	Target	Unit
TB.Titan 03/06	14,779	15,268	Littre
TB.Titan 03/06	45,744	47,942	Littre
TB.Titan 05/04	29,448	31,650	Littre
TB.Titan 07/08	27,855	31,650	Littre
TB.Titan 07/08	26,544	30,456	Littre
TB.Titan 09/10	24,503	31,650	Littre
TB.Titan 09/10	19,664	30,456	Littre
Titan 70	39,435	60,000	Littre
TB.Titan 11/12	52,923	52,734	Littre
TB.Titan 13/14	45,223	52,734	Littre
TB.Titan 15/16 A.	31,411	31,650	Littre
TB.Titan 15/16 B.	30,166	31,650	Littre
TB.Titan 17/18	44,555	52,734	Littre
TB.Titan 19/20	51,293	52,734	Littre
TB.Titan 21/22	27,434	30,456	Littre
TB.Titan 23/24	29,620	30,456	Littre
Average	36,040	40,948	Littre

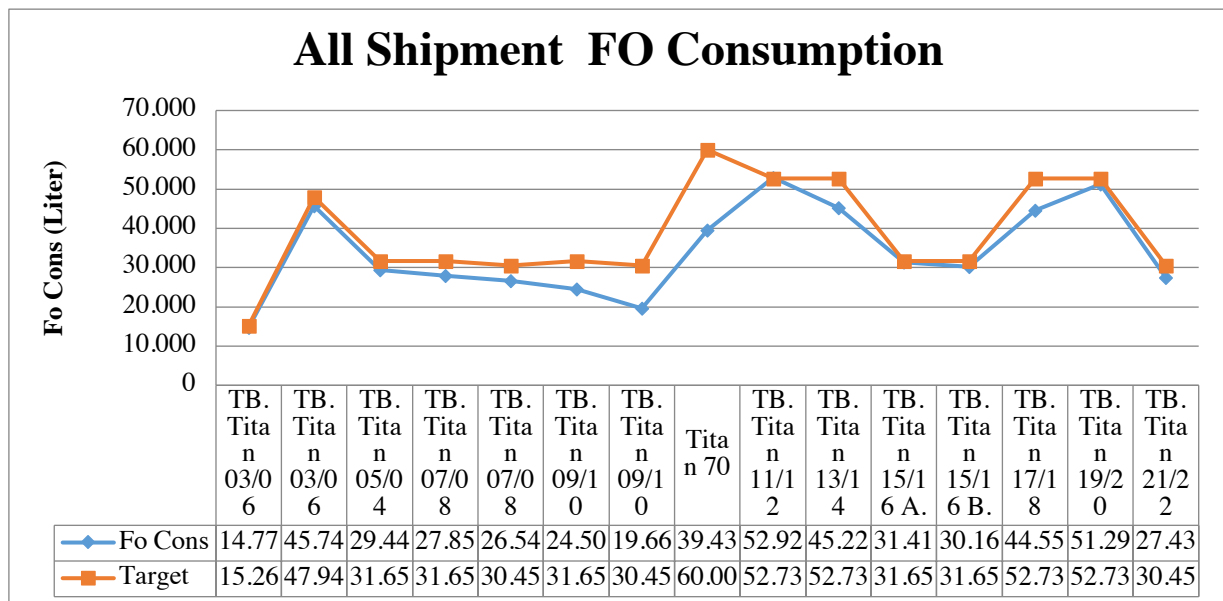


Figure 5. Graph of All the Ship Fuel Oil Consumption

3.2 eGenKit Identification

eGenKit is a system based on monitor long-distance web-based and solutions to control and help the company make a decision accurately to optimize its operation. eGenKit consist of:

- panel localized (hardware) to be fitted on board, and
- server centralized (to store data and management).

eGenKit does not require software which enables the user to have access to the ship all the time and anywhere. eGenKit uses transmission data hybrid between GPRS and satellite to produce a data transmission that costs cheaper and can cover revenue thoroughly.

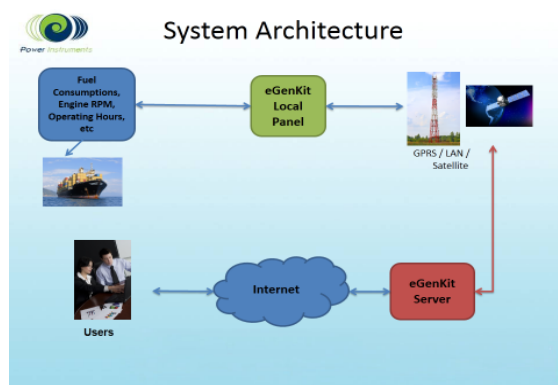


Figure 6. System Architecture of eGenKit

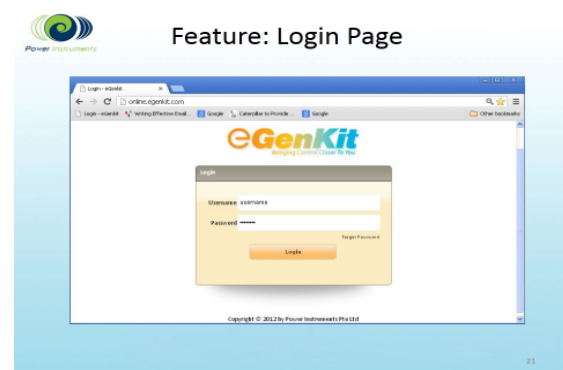
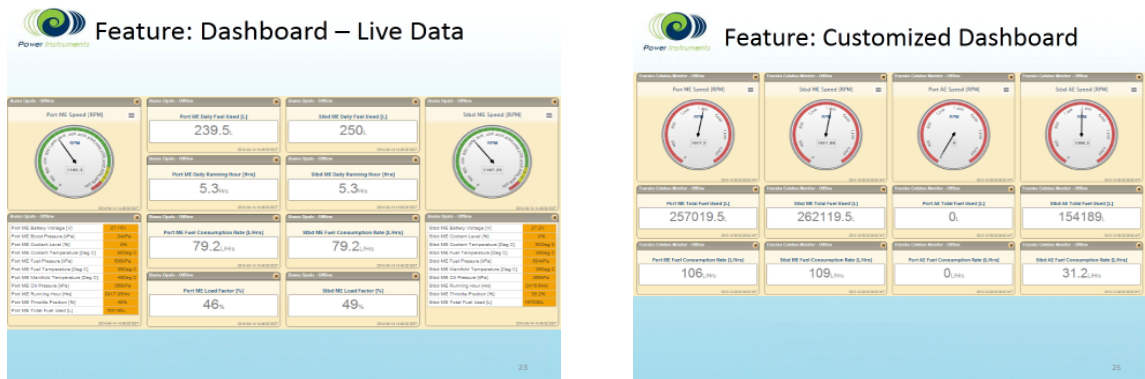
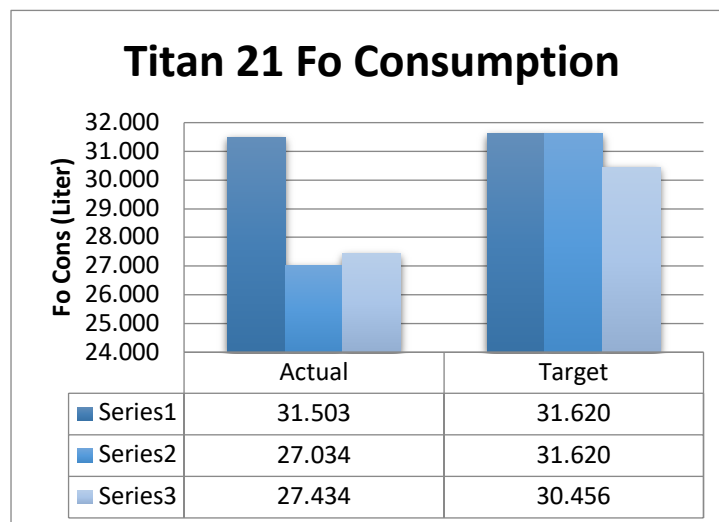
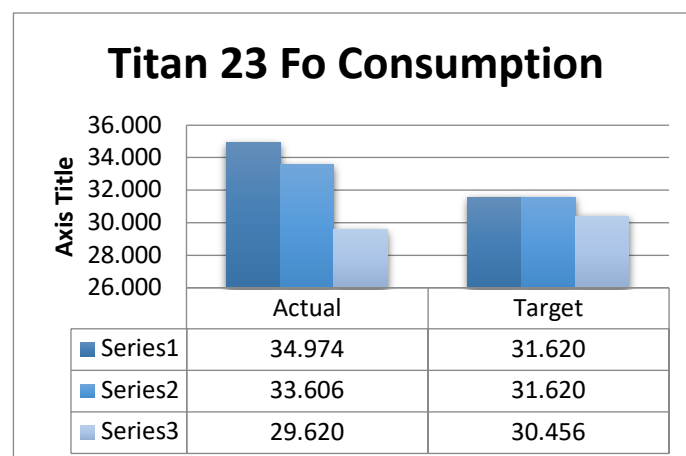


Figure 7. Login Page

**Figure 8.** Dashboard Display

3.3 Fuel Oil Consumption of the Ship After Used eGenKit

**Figure 9.** Fuel Oil Consumption of Titan 21**Figure 10.** Fuel Oil Consumption of Titan 23

4. Conclusion

1. From the consumption of fuel, it can be seen that there has been a target as follows:

Titan 21	Actual	Target	Unit
April	31,503	31,620	Litre
May	27,034	31,620	Litre
June	27,434	30,456	Litre

Titan 23	Actual	Target	Unit
April	34,974	31,620	Litre
May	33,606	31,620	Litre
June	29,620	30,456	Litre

2. Socialization will be conducted in all ships on the target fuel efficiency, currently has been running in some ships and there are good reception from crew members of the ship.
3. Furnish equipment for fuel-sensor, fuel-monitoring, fuel-security, including: equipment fuel-sensor package to new ship (Titan 25, Titan 27, Titan 29 and Titan 31), there are 3 choice, namely:
 - eGenKit, package 1 flowmeter Coriolis and rpm censorship, GSM transmitter,
 - Broil, package 4 flowmeter oval-gear and rpm censorship, GSM transmitter.
 - Aquametro, package 4 flowmeter rotary and CCTV rpm + GSM CCTV transmitter.

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