EA 3050:
Computer Based Remote Operated Marine Valve Control System

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1. Introduction

Aboard a ship, open-close type valves (butterfly type) are mostly used for ballast water operations (ballast water - sea water, being used to maintain the stability in dedicated tanks). Not only this, even for pump discharge flow controlling, proportional type valves are used. Mostly, these valves are located in very difficult to reach locations. Reaching these in rough sea conditions is even more difficult ,during operations.

This poroposal allows the user to control them from a control station with visible valve position feedbacks.

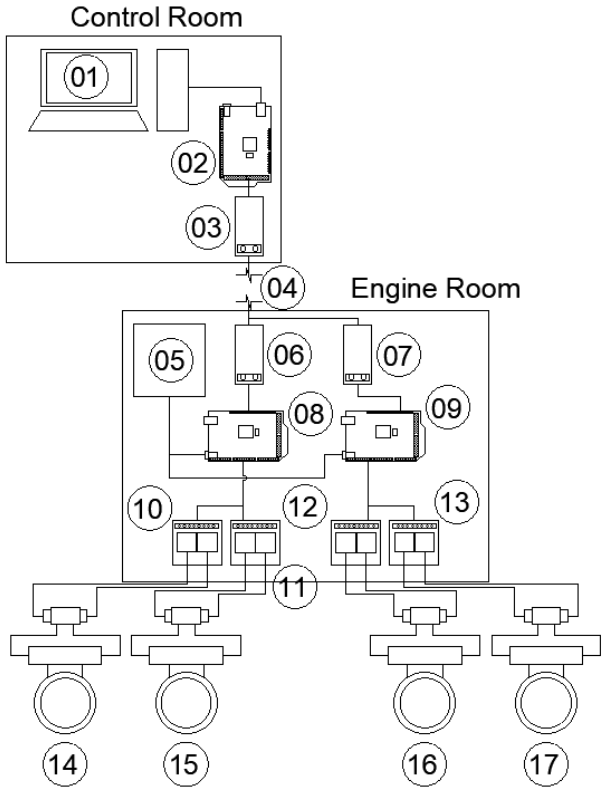
2. Targets

The main objectives and features of the proposal are as follows.

- To make all such valves remotely operable with the visible status indications staying in single control station.
- To minimize the complex wiring involvement with the use of communication protocol, RS 485 and lessen the electronic noise influence
- To make all valves operable from a computer HMI , to view the statuses and to make error detectable from the same
- To implement a low-cost solution for present extremely expensive systems and hence make a way to a Dollar inflow to the country.

3. Methodology

With a computer program # 01, written on .Net platform, the valves will be commanded, status monitored, and errors detected. The Arduino board, # 02 in figure, will convert the Modbus communication into an RS 485 communication which withstands more to the electronically noisy environment in the engine room. # 03 RS 485 modem will then carry the signals to engine room with a noise reduction type screened special cable (# 04). # 06 & # 07 RS 485 modems will receive the communication parallelly and send to # 08 & # 09 Arduino boards respectively. # 05 is the power supply (220VAC-5VDC). # 10, # 11, # 12 & # 13 are the relay drivers used to drive the hydraulic solenoid coils in any desired voltage (as the occasion calls). # 14 & # 16 are on off (open close/ 2 state) type valves. They also are equipped with a position feedback unit to give the status to the system. # 15 & # 17 are the proportional type valves which can be operated as fractions. They are equipped with potentiometers to give the feedback to the system.



#	Item
01	HMI/ Computer
02	HMI side Arduino board
03	HMI side RS485 modem
04	Screened noise reduction cable
05	220VAC-5VDC power supply
06	RS 485 modem for group # 01 valves
07	RS 485 modem for group # 02 valves
08	Field side Arduino board for group #01
09	Field side Arduino board for group #02
10	Group #01-#01 valve relay driver
11	Group #01-#02 valve relay driver
12	Group #02-#01 valve relay driver
13	Group #02-#02 valve relay driver
14	Group #01-#01 double state valve
15	Group #01-#02 proportional valve
16	Group #02-#01 double state valve
17	Group #02-#02 proportional valve

Note_1: Hydraulic system is not shown in the figure

Note_2: System will be demonstrated with some miniature motorized valves instead of hydraulic ones.

4. Cost Estimate

#	Description	Qty	Estimate
01	Arduino boards (Uno)	03 Nos	7800/=
02	RS 485 Modems (Arduino)	03 Nos	1200/=
03	Double type relay driver modules	04 Nos	1250/=
04	220VAC-5VDC Power supply	01 Nos	1300/=
05	Motor driver assemblies (for prototype)	04 Nos	1500/=
06	Consumables (Wires, lugs etc.)	01 set	3000/=
	Total		16050/=

5. References

- https://www.emerson.com/en-us/industries/automation/marine/marine-systems-solution/valve-remote-control-systems
- https://www.nakakita-s.co.jp/en/remote.html