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Real Time Water Wash System of Gas Turbine in Power Plant

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ABSTRACT: Gas turbine compressors consume approximately 60% of the overall cycle energy during operation. The compression cycle consumes large quantities of air and despite intake filtration, small quantities of dust, aerosols and water pass through and deposit onto the blades. These deposits impede air flow through the compressor and over time degrade overall performance of the gas turbine. So a regular washing technique is required for cleaning the turbine. There are two type sof water wash system . Currently, the complete process of handling the valves and acquiring data from sensors is done by Turbine Control Panel. Turbine Control Panel is a DCS that handles lot of skids or systems in the power plant. Complete control and operation by Turbine Control Panel leads to overhead it with unnecessary complications. Any change in the system, such as addition of temperature transmitter or solenoid valves will result in modification of control software in Turbine Control Panel and also needs new cables for interconnection purpose.

The above situation can be easily solved by introducing a real time embedded system located in the Water Wash System. The local instruments (temperature transmitters, level switches and solenoid valves) will interact with this local controller and the local controller will be control the valves. The local controller combines the data provided by all the transmitters and along with the process variables the information is send back to the Turbine Control Panel via Fiber Optics or advanced communication protocols for better data transmission. Any addition of instruments will lead to modify only the Real Time Controller application and wiring of the Water Wash System. This ensures **better** performance and reduces considerable amount of resources.

KEYWORDS: Microcontroller , rto, embedded c, micro plc,

I. INTRODUCTION

Gas Turbine Compressors consume approximately 60% of the overall cycle energy during operation. This cycle consumes very large quantities of air and although this air is filtered, small quantities of dust, aerosols and water pass through the filters and deposit on the blades. These deposits decrease the air flow of the compressor and the overall performance of the gas turbine. Compressor cleanliness can be maintained using a routine program of water washing. There are two water wash maneuvers performed on gas turbines: Off-Line and On-Line. An Off-Line maneuver is conducted with the gas turbine in a cooled state using cranking speed, while an On-Line maneuver is conducted with the machine at operating temperature and uses water only. Both Operations use highly atomized water spray patterns designed to completely enter the compressor core. The Off-Line cleans the entire core and recovers lost performance, while the On-Line cleans the early stages and maximizes the time period between needed Off-Line washing to provide peak availability.

There are two methods used for axial compressor cleaning:
• ON-LINE WASHING with the machine running at full speed and loaded
• OFF-LINE WASHING with the machine on crank Cleaning consists of injecting detergents into the inlet following defined procedures.

on-line washes alternates with an off-
line wash. Correct application of this procedure allows the turbine performance loss to be kept close to that due to aging of the machine, identified as non-recoverable degradation.

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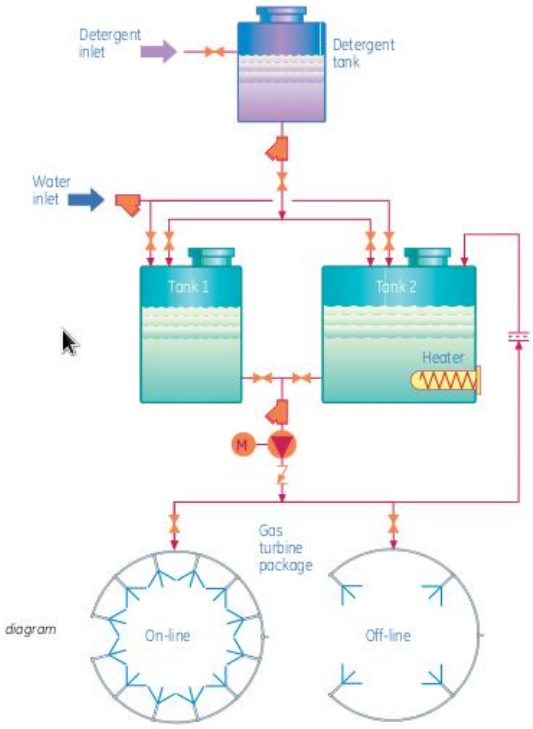

Any change in the system, such as addition of temperature transmitter or solenoid valves will result in modification of control software in Turbine Control Panel and also needs new cables for interconnection purpose.The above situation can be easily solved by introducing a real time embedded system located in the Water Wash System. The local instruments (temperature transmitters, level switches and solenoid valves) will interact with this local controller and the local controller will be control the valves. The local controller combines the data provided by all the transmitters and along with the process variables the information is send back to the Turbine Control Panel via Fiber Optics or advanced communication protocols for better data transmission. Any addition of instruments will lead to modify only the Real Time Controller application and wiring of the Water Wash System. This ensures better performance and reduces considerable amount of resource

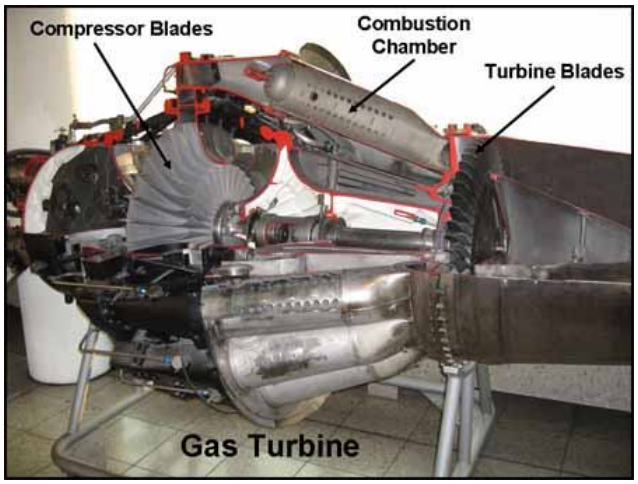

Fig of a gas turbine

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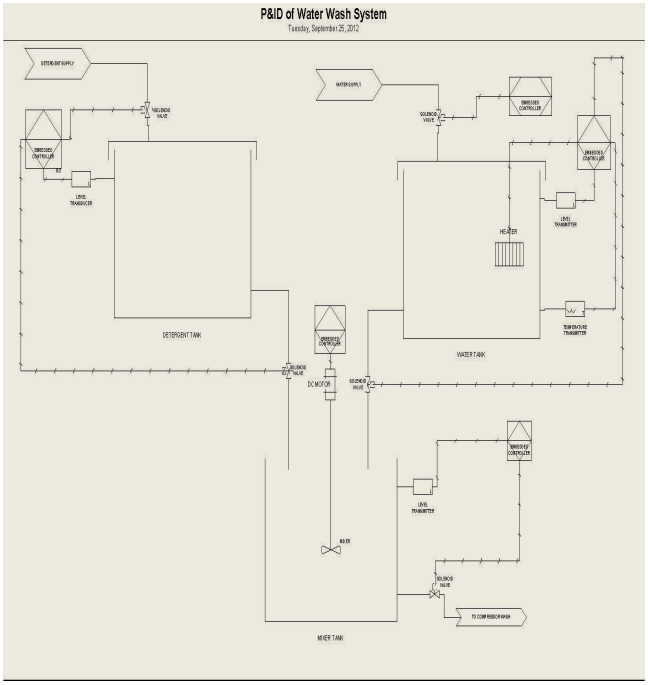
II.PROPOSED SYSTEM

(I) A real time water wash system has been devlouped for monitoring and controlling the flow of detergent , fluid etc
(II) Using this system we can manage the solenoid to manage the flow .
(iii) By this system if any a the turbine can be washed as required .
(iv) It will cut off the cost of the process by reducing cost of devlouping new software if any thing new is introduced to the system.
(v) And it also reduces the complication and cost of the wiring etc.
(vi)About million of rupees can be saved using this project .

Block Diagram



III.SYSTEM DESCRIPTION

This system mainly consist of solenoind valve , micro plc made of microprocessor . I.C 7408 etc. This process will contol the flow of detergent and fulid . In this process there are three tank the 1st one contains water , other contain detergent and the 3rd for mixing both of that. A hetter is applied to the tank cantaining water . Till the water gets heated till 120`C . For Standard process . To know the wheather the water temperature has reache the set point or not a temperature sensore is applied to the water tank. Asthe temperature reaches the set point , the solenoid valve gets opened and hence the water from the water tank is realeased . And the detergent from the other tank is also realesed . As both the liquid flow to the mixing tank and hence mixed . From there another solenoid valve allows the flow of th fluid to the compressor and then tu th turbine. Using RS232 cabel the process is connected to the micro plc. And hence using virtual instrumentation the process is crarried out.

Applications :

I. Used in power plant to reduce cost .
II. Use of real time system in process
III. Quick reponse of the system
IV. Deacrease complexity

IV.CONCLUSION

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In a devlouping country like India ,money is one of the greatest factor for the devloupment . Our project is mainly concerned to reduce the cost of the process . Our process has many benefits like Recoverable losses account for 70% to 85% of the performance losses ,On-line compressor washing can maintain compressor efficiency. Off-line systems can clean heavily fouled compressors. Fouling can be minimized by maintaining inlet filtration system and inlet evaporative coolers. Periodic inspection and prompt repair of compressor blades help control fouling . Quality of intake air affects the performance of a gas turbine. Airborne contaminants in a compressor can cause:
– Erosion
– Corrosion
– Fouling
The operating environment and filtration level of a compressor determine the type and rate of fouling. To minimize fouling:
– Reduce oil leaks and ingestion of oily constituents
-Filter the incoming air
Use compressor washing to:
– Slow down corrosion
– Reduce the formation of fouling deposits
Maintain compressor performance
Hece at last I would like to conclude that our project will reduce cost , of the process , will maintain better facility, reduce the need of human interfernce etc.

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