GUIDELINE FOR SWAS PANEL TYPE SELECTION FROM LATEST AVAILABLE OPTIONS

1.0 INTRODUCTION

Steam & water analysis system (SWAS) is dedicated to analysis of steam & water in power plant to ensure protection of boiler and turbine from impurities; by preventing corrosion/salt deposition in boiler tubes and corrosion, salt/silica deposition, erosion in turbines blades. The measured parameters are pH, conductivity, silica, sodium, dissolved oxygen, chloride etc. Power plant SWAS system consists of 2 units. One is wet panel i.e., sample conditioning panel & other is dry panel with microprocessor based electronic analyzers.

Steam & water sample conditioning panel is required for proper conditioning of water & steam samples. The function of this conditioning panel is to reduce and regulate the temperature, flow and pressure of the water & steam samples. Dry panel analyser houses analyzers of different types enabling online analysis of steam & water at various sample points in power plant. These analysers are installed in air conditioned environment in order to maintain dust free environment with fixed temperature of approximately 25^0C to 30^0C.

Generally, a separate air conditioned room is provided for dry analyser panel. Room air conditioning could be either from plant centralised AC system or room specific split AC system depending on the plant design concepts.

2.0 PANEL DESIGN

Main purpose of panel is to keep electronic devices in relatively clean environment away from dust, humidity, water splash & ambient air contaminated with oil, corrosive vapour etc. If these are not prevented, heat sensitive electronic components shall inevitably fail, which shall lead to the failure of entire production/control systems. Also, heat shall be dissipated from panels accordingly.

Different protection categories are provided for panels depending on installation location. This means that any external influence of environment should not penetrate the panels and also heat dissipated from components shall be driven outside. If the panels are closed, then heat to be dissipated via panel walls or panel wall slit openings. Trouble

free and maintenance free operation of analysers depend on how the heat generated by electronic components is dissipated from panels to the outside without leading to failure of electronic components in the analyser panels.

With improved design features, various options are available now for panel enclosures which can be utilised for designing the SWAS system. These enclosures are energy efficient and have environmental friendly control solutions tailored to suit individual customer requirements. However these also depend on the project layouts & design concepts.

3.0 OPTIONS AVAILABLE ARE:

A) Panels in air conditioned room (Split AC Unit)

B) Panels fitted with air conditioned units

C) Panels fitted with heat exchangers

3.1 PANELS IN AIR CONDITIONED ROOM (SPLIT AC) Option A

The analyser panels are generally placed in separate SWAS room located in power house building at ground level. The size of the room is small, so depending upon the size of the analyser room, number of split AC units are designed & installed. The cost of the AC units is less, but energy consumption and maintenance cost are high.

3.2 PANELS FITTED WITH AIR CONDITIONED UNITS – Option B

In this option, SWAS panels are fitted with air conditioned units, the number of units depending upon the size of panel. This option can be opted when panels size is small and construction of air conditioned room is expensive or in case of space constraint. These are with minimum IP 54 protection and work in ambient temperature -55 deg to 60 deg. This unit consists of compressors, large heat exchanger surfaces & condensate evaporation system.

3.3 PANELS FITTED WITH HEAT EXCHANGERS – Option C

In this option, panels are fitted with heat exchangers supplied with cooling water from chillers instead of air conditioned units. This cooling solution is suitable for panel with microprocessor based analysers. This panel is dehumidified i.e, moisture in air condenses in panel and is led to separate condensate drain. Local cooling package system can use water or refrigerant.

In this case, chilled water from plant centralized air conditioning system is used, since in all power plants and large industry - centralized air conditioning system is available.

Chilled water from centralised system can be considered and temperature of chilled water is optimum resulting in improved efficiency. Hence small quantity of chilled water can be tapped for SWAS dry panel which could be an economical solution. This chilled water requirement preferably to be taken into consideration during the design planning stage depending upon the capacity of the chiller unit in the centralized chiller unit.

To arrive at an optimized solution, case study for a project was carried out and all three options evaluated. Few information were obtained from market to ascertain technical details & values.

4.0 CASE STUDY

Case study was carried out for a typical SWAS system installation for a power plant. This case study is conducted only to illustrate the relative merits of the three options.

OPTION A

The cost of AC unit is Rs 0.18 Million. Capitalisation of Opex cost for 25 Years is Rs 2.6 Million

Total cost for a 25 years cycle – 2.8 Million

OPTION B

The cost of Panel AC units (2 No's) is Rs 0.65 Million Capitalisation of Opex cost for 25 Years is 1 million.

Total cost at end 25 years – 1.7 Million.

OPTION C

The cost of panel with heat exchanger units (2 No's) is Rs 0.3 Million — Capitalisation of Opex cost for 25 Years is 0.35 Million

Total cost at end 25 years – 0. 7 Million

From the above analysis, it is obvious that Option C is advantageous from OPEX point of view. It saves almost Rs.2.0 million over a period of 25 years.

Quantity of chilled water tapped from main chiller of plant used by heat exchanger in option C to dissipate heat from panel is negligible and hence, there is no increase in chiller capacity & its cost. . As per the study done on the projects, it is found that quantity required shall be in the range of 1/100 th capacity of a centralized chiller unit. Only the pipe & tapping cost is to be considered which is negligible. Hence using chilled water from plant centralised air conditioning system is advantageous.

This option of using chilled water from plant centralised AC system should be the reviewed and utilised.

Salient features and assumptions considered for the case study options are:

a) Analyser panel considered for typical 600/ 660 MW plant with required number of Silica, sodium, chloride, PH, conductivity analyzers.

b) The SWAS room dimension shall be twice the panel area with ambient temperature of 40 deg and dust free environment or 35 deg with a ventilation duct extended from main plant.

c) The temperature inside the panel shall be maintained between 25 to 30 deg and is adequate for all analysers

d) Chilled water from centralised system shall be around 10 to 12 deg and with a pressure more than 3 bar & flow of 20 Liters /minute

e) All the calculation of power consumption and respective costs are obtained from market & project data bank.

f) The replacement cost of all the AC units at end of 12th year is considered.

5.0 CONCLUSION

Above options are indicated with notional cost comparisons to give additional information on subject indicated above for design and finalisation of option. So designer, depending upon the project layouts & design concept can decide the type of SWAS panel for the project. This can be proposed after review & consultation with project specific analyser vendors & client. This guideline provides additional information to save cost in OPEX without any effect on functionality of analysers.

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