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Adaption of Intelligent System for Power Generation

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ABSTRACT

It has been observed that fuzzy PID produced an comparable or even better control performance then the traditional PID controller or fuzzy control alone. As intelligent PID is capable of learning and extracting required control rules automatically from the controller environment. The fuzzy overcome fixed gain of PID and take the support nonlinear mapping of fuzzy which make it more suitable for complex process. The theoretical study and practical application indicate that the application of intelligent PID controller in thermal power plant process monitoring and control is profitable, effective and acceptable by control engineering system This design controller used for air to fuel ratio optimisation in the combustion process of a power plant boiler and this optimization of air to fuel ratio through this controller reduce the excess air level and improve the combustion efficiency.
Keyword : PID Controller, Hybrid Control .Combustion Efficiency, Air To Fuel Ratio Nonlinear System.

I. INTRODUCTION

Since power plant is an multi variable dynamic system from very early stage conventional control technique using traditional PID controller satisfy operation process as it is easy to maintain and operate at root level user also however power sector has challenge meeting growing demand by increasing power generation in the same time it is know that that power plant utilised only 30% of energy value of prime fuel There is 70% losses mostly in the form of heat which is difficult to minimise with condensational controller. In addition to this to minimised the losses new design has come up and its compel mathematical modelling exists. This entire problem can be overcome with advance process control engineering using fuzzy PID or intelligent PID controller. In this paper different control techniques as PID. Controller. intelligent PID , fuzzy controller are applied to regulate manipulating variable air fuel mostly to control over furnaces temperate due to change of load as maintain The simulation result shown that FGPI controller developed in this study perform better than conventional PID controller on the setting time and over shoot of air to fuel regulation ratio

BACK GROUND OF POWER GENERATION SYSTEM

The three basic control unit is necessary ,one is to central (main) as combustion control other two PID for fuel/ air line regulation as directed by combustion control unit fuzzy PID. The individual at PID at both air/fuel in regulate the required fuel and excess air to achieve a set point. The set point for excess air was 10% as supplied by the plant. The fuel require meant at the combustion was set dependent on the energy required meant in the boiler and reheating in power generation model. This will increase the functionality of the model to produce any set amount of power output. Hence combustion control adjusts the cool and air flow to optimise steam production for steam turbine generator. However combustion control is complex and inputs a number of independent operating parameter including combustion efficiency, steam temp. turn ace staging fouling and No x formation. The technology includes instrument and control for measured carbon levels in ash, cool flow rate, air flow rate, Co level, engine level, slag deposits and burner metrics as well as advanced coal nuzzle and plasma assisted coal combustion. If suitable automation use the efficiency increase by 0.15% to 0.84%.

There are complicated models based on finite elements approximation to partial differential equations. These models are in the form of large simulation codes for plant design, simulators and commissioning. However they are not normally used in control design approach because of their complexity. The analytical combustion model can be formulated based on the fundamental laws of physics such as conservation, momentum and energy semi- empirical law for heat transfer and thermodynamic state conversion. To build such analytical models it is necessary to define their parameters with respect to boundaries, inputs and scan be used to can be used to outputs. Generally the developed models need t be tuned by performing tests to validate for steady state and transient response .In addition a mathematical plant model can be developed based on measured data obtained from real performance of the plant. The gather information from experiment can be used to developed test data based models by using system identification techniques. The four main step to determine a test based model from input output data includes collection of data from experiment .Choosing a model structure estimation of model parameter and model validation. Soft computing methods can be used to maximise control model parameters over a full range of input output data. For tanning and adaption of system parameter neuro fuzzy control is use now days.

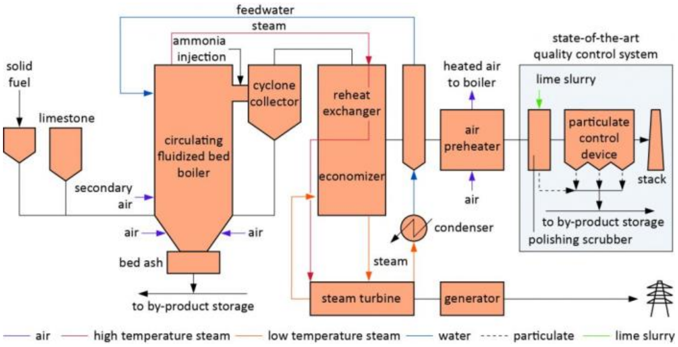


Figure 1. Operation representation associate to combustion system

Intelligent Model

It is well know that intelligent systems which can provide human like expertise such as domain knowledge, uncertain reasoning, and adaptation to a noisy and time varying environment are important in tacking practical computing problem. In contrast with conventional artificial intelligence techniques which only deal with precision, certainty and rigor, the guiding principle of soft computing is to exploit the tolerance for imprecision, uncertainty, low solution cost, robustness, partial truth to achieve tractability In general developing intelligent system by hybridization is an open ended rather than a conservative concept. To achieve a high intelligent system, a synthesis of various techniques is required. Each technique plays an important role in the development of different hybrid soft computing architectures.

a)PID Controller

Proportional –Integral – derivative PID controller , which have relatively simple structure and robust performance are the most common controller in industry by taking the time derivative of the both side of the continuous time PID equation and disserting the resulting equation are easily gets the PID equation in the incremental form as below.

The PID controller is traditionally suitable for second and lower order system .It can also be used for higher order plant as here with dominant 2nd order behaviour. For PID controller in combustion cycle monitoring and control value of tuning parameter .Usually initially design value of PID controller obtained by all means needs to be adjusted repeatedly through computer simulation until the close loop system perform or compromise as desired .This simulates the development of intelligent tools that can assist the engineers to achieve the best overall PID control for entire operation envelops

b)Fuzzy Controller

In contrast to conventional control techniques, fuzzy logic control is best utilized in complex ill-defined processes that can be controlled by a skilled human operator without much knowledge of their underlying dynamics. The basic idea behind FLC is to incorporate the "expert experience" of a human operator in the design of the controller in controlling a process whose input – output relationship is described by collection of fuzzy control rules (e.g., IF-THEN rules) involving linguistic variables rather than a complicated dynamic model. The utilization of linguistic variables, fuzzy control rules, and approximate reasoning provides a means to incorporate human expert experience in designing the controller. FLC is strongly based on the concepts of fuzzy sets, linguistic variables and approximate reasoning introduced in the previous chapters. A typical architecture of FLC , comprises of four principal comprises: a fuzzifier, a fuzzy rule base, inference engine, and a If the output from the defuzzifier is not a control action for a plant, then the system is fuzzy logic decision system. The *fuzzy rule base* stores the empirical knowledge of the operation of the process of the domain experts. The *inference engine* is the kernel of a FLC, and it has the capability of simulating human decision making by performing approximate reasoning to achieve a desired control strategy. The *defuzzifier* is utilized to yield a nonfuzzy decision or control action from an inferred fuzzy control action by the inference engine.

c)FuzzyPID

The fuzzy PID controller is the natural extension of this conventional version which preserves their linear structure of PID CONTROLLER. The fuzzy PID are designed using fuzzy logic control principle in order to obtain a new controller that possesses analytical formulas very similar to digital PID controller. Fuzzy PID controller has variable control ain in their linear structure. These variable gains are non liner function of the error and changing rates of error signal. The main contribution of this variable gain in improving the control performance is that they are self tuned gain and can adapted to rapid changes of the error and rate of changes of error caused by time delay effects, nonlinearities and uncertainties of the

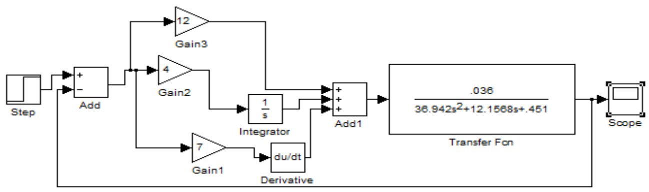


Figure 2. simulink modelling of furnace control with PID control

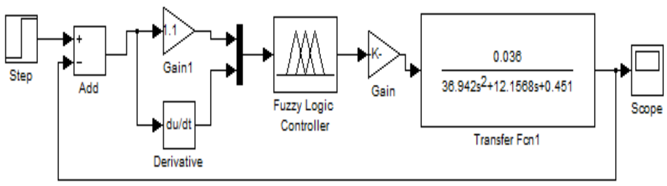


Figure 3. simulink modelling of furnace control with fuzzy control

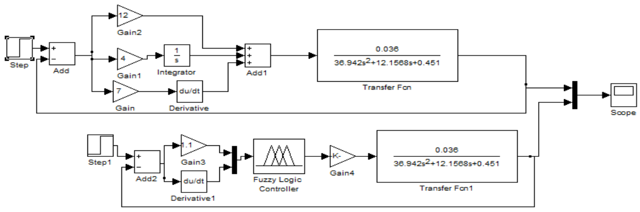
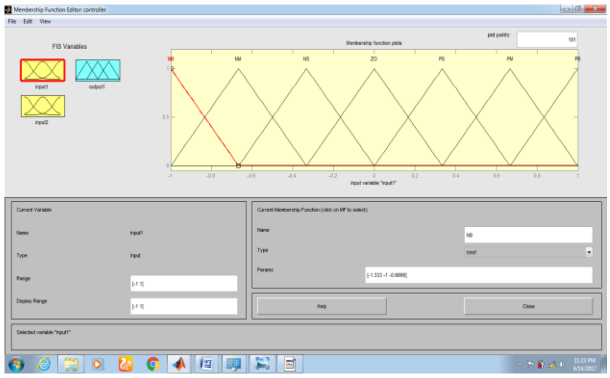
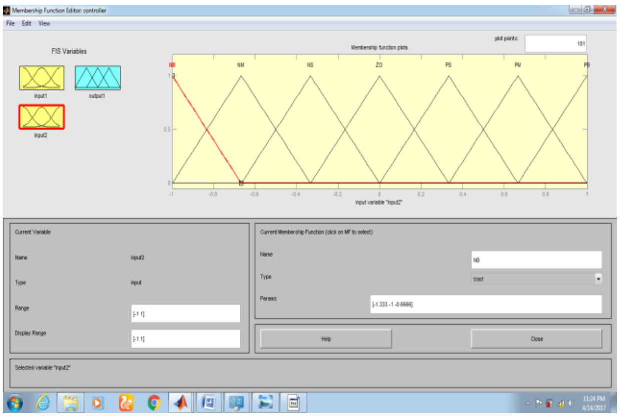
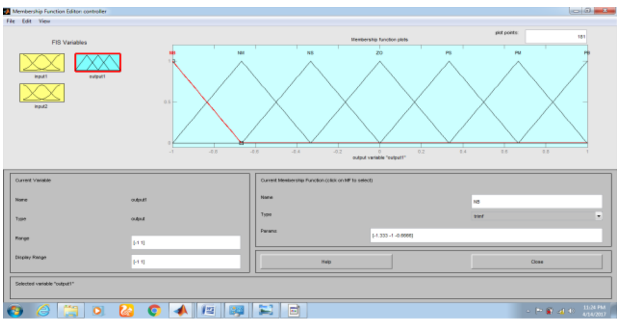


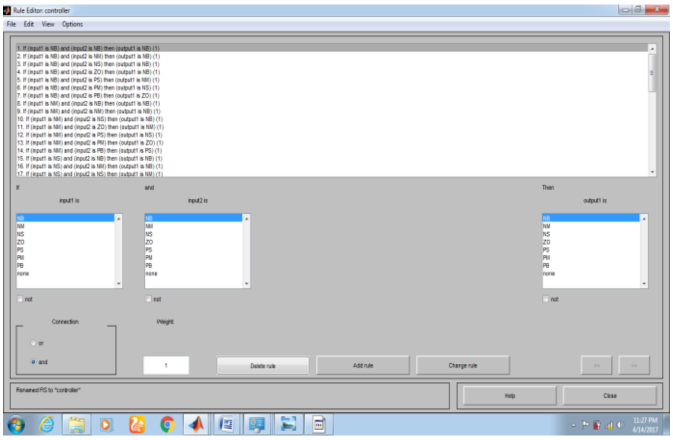
Figure 4. PID;-simulink modelling of furnance control with fuzzy control)

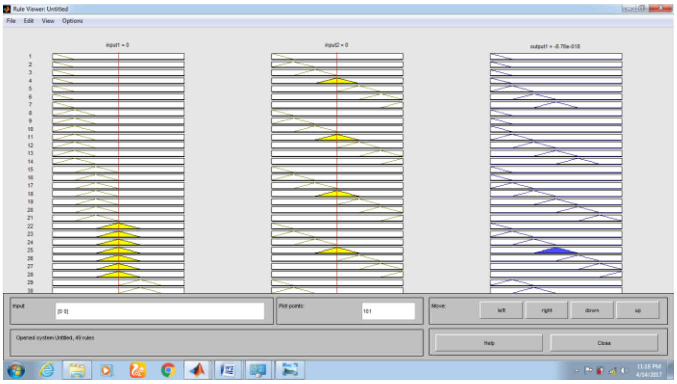
INTELLIGENT CONTROLLER SIMULATION AND ITS RESPONSE











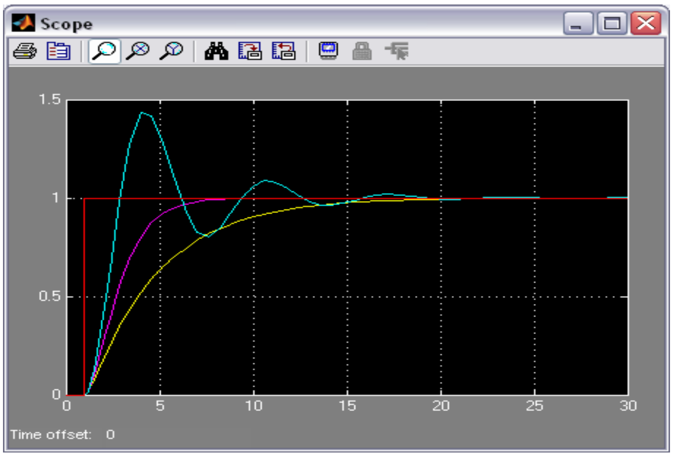


Figure 5. comparison of controller responses for different mode of controller

II. CONCLUSION

Through paper combining of PID characteristic in fuzzy system in a control action utilise the excellent learning performance and adaption. The basic motto of this proposed controlling model is to reduce the excess oxygen of exist so as to increase the combustion efficiency of a coal fired boiler. It is verified with PID /FUZZY/ PID FUZZY controller and tuned that the proposed FUZZY PID controller builds a good modelling characteristic for this complex non liner system with desired accuracy. Witch can touch the expecting efficiency range in different operating condition and surrounding .Hence this module may be use at different capacity of thermal power generating unit.

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