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Design Of Controllers For Flow Process In Labview

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Abstract: Flow is the most significant parameter that is measured in process industry. In flow process set point tracing is the most important algorithm which is obtained using computing algorithm like PID, IMC, IMC-PID. IMC and IMC-PID controller characteristics is compared with conventional PID controller. To obtain the better performance to bring the process in desired set point. In process control application, spontaneous controllers are introduced. The different controllers are included in this paper (PID, IMC, IMC-PID). The most widely used trade controller is the PID (Proportional-Integral-Derivative) controller. Here the tuning of PID controller is done using Cohen coon method. The Internal Model Control (IMC)-based approach for controller design is one of them using IMC and its equivalent IMC based PID to be used in control applications in industries. IMC-PID is used for tracking set point for unsteady process.

Keywords: Flow, IMC, IMC-PID, PID.

I. INTRODUCTION

Flow process is a highly non-linear process. The Controllers such as IMC, IMC-PID and PID performances is compared. IMC is a common method which is used for tuning and designing various controllers. Most of the control objective used in PID controller was accepted by many control industries. It is highly used to handle inaccuracies in process. Disturbance rejection is most important factor in IMC-PID than set point tracking. IMC based on pole zero cancellation. However, the IMC results in a long settling time for the load disturbances for lag dominant processes which are not desirable in the control industry. Since all the IMC-PID approaches involve some kind of model reduction techniques to convert the IMC controller to the PID controller so approximation error usually occurs. This error becomes Spartan for the process with time interval. For this we have taken specific transfer functions with significant time interruption or with non invertible portions enclosing RHP poles or the zeroes.

Here we have used different procedures like factorization to get rid off these error containing materials. It is because if these faults are not detached then even if IMC filter gives best IMC performance but structurally causes a major error in conversion to the PID controller, then the resultant PID controller could have poor control performance. The basic function of a controller is to execute an algorithm based on the control engineer's input , the operators desired operating value and the current plant progression value. In most cases, the requirement is for the controller to act so that the process value is as close to the set point as possible. The PID control algorithm is used for the control of almost all loops in the process productions, and is also the source for many advanced control algorithms and approaches. In order for control coils to work properly, the PID circle must be accurately modified. Regular methods for tuning loops and criteria for judging the loop tuning have been used for various years, but should be reexamined for use on up-to-date digital control systems. While the basic system has been unaffected for many years and is used in all distributed control systems, the actual digital execution of the algorithm has changed and differs from one system to another.

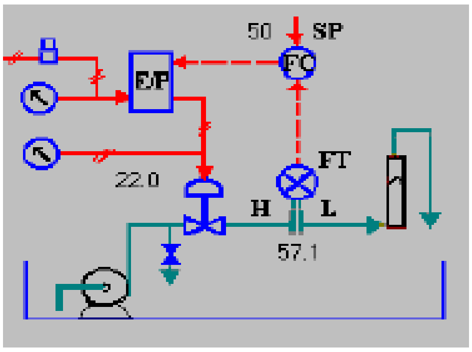
II. LABVIEW

Laboratory virtual Instrumentation Engineering Workbench. It has three major portions front panel, block diagram, Icon and connector pane. Lab view is a industrial standard computer equipped with manipulator friendly application software, cost operative hardware and driver software that performs the function of customary instruments. Lab VIEW systems are realized in test and measurement, as well as process observing and control applications throughout the world. These applications differ widely from transportation structures monitoring, to university workshop classes; from automated parts testing to trade process control.

III. FLOW PROCESS:

The aim of this paper is to control/maintain the outlet flow within a desired limit. The flow controller can be used to control the flow of any plant. The flow process is the fast process and nonlinear process. Flow sensors like orifice, venture, pitot tube, dall tube, flow nozzle. The flow sensor used here is orifice plate.

FLOW PROCESS TRAINER 312 KIT:



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MATHEMATICAL MODELLING

The development of a process model play a vital role. Transfer function was obtained by Process Reaction Curve (PRC) method.

$$G(S) = \frac{Ke^{-t_{ds}}}{\tau S + 1}$$

IV. PID CONTROLLER

The basic function of a controller is to execute an algorithm (electronic controller) based on the control engineer's input (tuning constants), the operators desired operating value (set point) and the current plant manner value. In maximum cases, the constraint is for the controller to act so that the process value is as close to the set point as possible. In a basic practice control loop, the control engineer utilizes PID algorithms to achieve this.

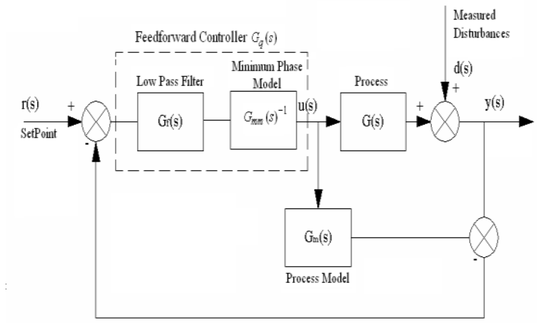
The PID control algorithm is used for the control of almost all loops in the process productions, and is also the origin for many progressive control algorithms and strategies. In order for controller loops to work appropriately, the PID loop must be suitably tuned. Typical methods for tuning loops and criteria for judging the loop tuning have been used for many existences, but should be reassessed for use on modern digital control systems.

Once the PID controller has the process variable equal to the setpoint, a worthy PID controller will not vary the output. You want the output to be very steady (not changing). If the valve (motor, or other control element) are frequently changing, instead of maintaining a perpetual value, this could case more attire on the control element.

IMC CONTROLLER FOR FLOW PROCESS

Internal Model Control (IMC) is a commonly used technique that provides a transparent mode for the design and tuning of various types of control. The ability of proportional-integral (PI) and proportional-integral-derivative (PID) controllers to meet most of the control objectives has led to their widespread acceptance in the control industry. The Internal Model Control (IMC)-based approach for controller design is one of them using IMC and its equivalent IMC based PID to be used in control applications in industries.

It is since, for practical uses or an actual process in industries PID controller algorithm is simple and robust to handle the model inaccuracies and hence using IMC-PID tuning method a clear trade-off between closed-loop performance and robustness to model inaccuracies is achieved with a single tuning parameter. As stated above that that actual process differs from the model of the process i.e. process model mismatch is common due to unknown disturbances entering into the system. Due to which open loop control system is difficult to implement so we require a control strategy through which we can achieve a perfect control. Thus the control strategy which we shall apply to achieve perfect control is known as INTERNAL MODEL CONTROL (IMC) strategy.



V. IMC-PID CONTROLLER FOR FLOW PROCESS

The advantage of only using tuning constraint to achieve a clear balance between closed-loop demonstration and Strength to model inaccuracies. Since all the IMC-PID approaches involve some kind of model drop techniques to convert the IMC controller to the PID controller so estimation error usually occurs. This slip becomes severe for the process with time lag. For this we have some assignment functions with substantial time delay or with non- invertible rations i.e. containing RHP limits or the zeroes.

Here we have used different practices like factorization to get rid off these error containing articles. It is because if these blunders are not removed then even if IMC filter gives top IMC performance but structurally causes a major error in renovation to the PID controller, then the consequential PID controller could have poor control performance.

Thus in our approach to IMC and IMC based PID controller to be used in industrialized process control submissions, there exists the optimum filter structure for each explicit process model to give the preeminent PID performance. For a given filter structure, as λ losses, the inconsistency between the supreme and the PID controller increases while the nominal IMC routine improves. It indicates that an optimal λ value also exist which concessions these two effects to give the finest performance

Controller	Kp	Ti	Td
PID	$\frac{(Tp+0.5t_d)}{(\lambda+0.5t_d)}$	$(Tp+0.5t_d)$	$\frac{(Tp*t_d)}{(2Tp+t_d)}$

VI. RESULTS AND COMPARISION

A PID controller has 3 modification parameters. Each tuning techniques will end up with different set of tuning limitations. The most widely used method is Cohen coon method which gives the Lab VIEW simulated result for the PID, IMC, IMC-Based PID Controller. This shows a constant output.

Controller	Rise Time	Peak Time	Settling Time
PID	3	1.08	20
IMC	4.5	-	5
IMC-PID	8	-	9

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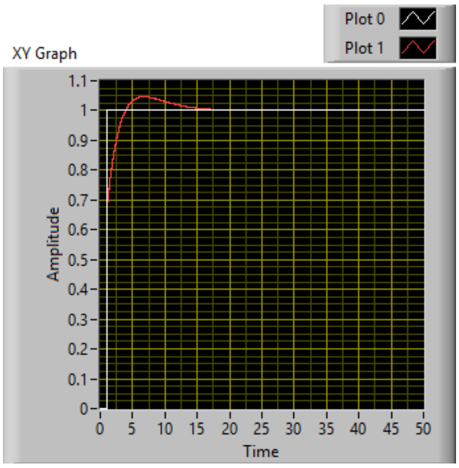
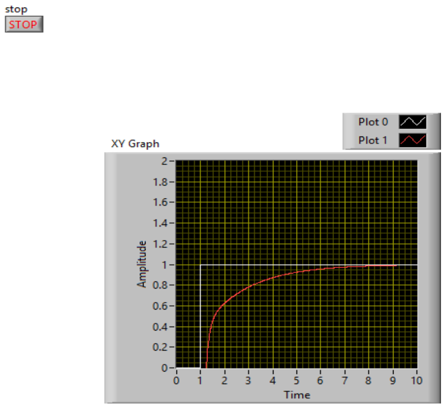
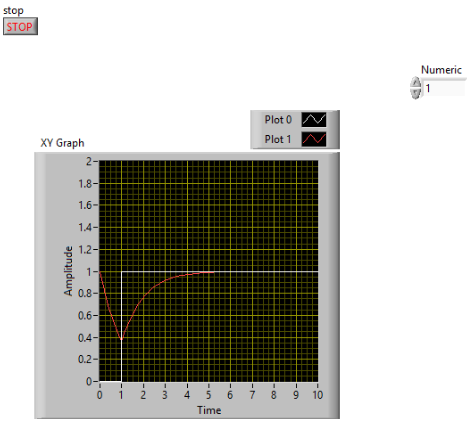
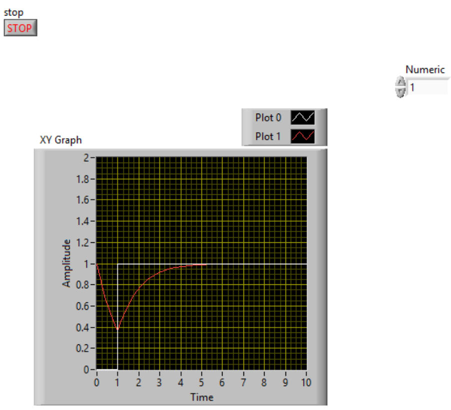
PID



IMC-PID







VII. CONCLUSION

The closed-loop responses for Cohen coon tuning for ultimate PID controller has overshoot. This is one of the major demerits to the CC tuning method. If the process circumstances change, then the control system may become unbalanced. In order to overcome this drawbacks IMC control is realized. The main benefit to IMC is that is provides a clear framework for control system strategy and tuning. Thus, IMC is able to compensate for disorders and model uncertainty. The Internal Model Control and the IMC- PID controller for the process are simulated and found to be good which ignores presence of Non linearity in the system.

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