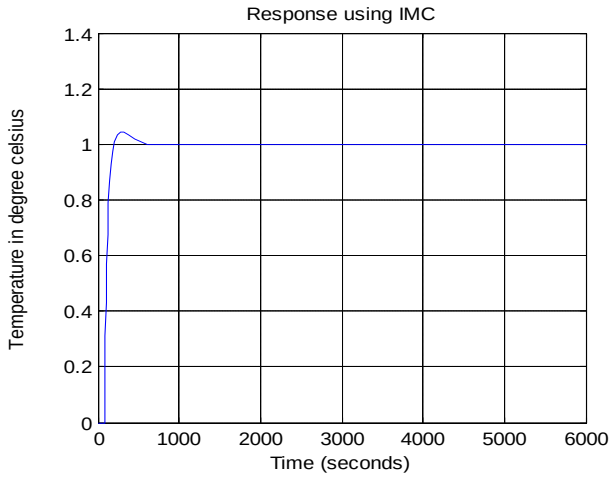

Figure 5: Response using IMC controller

Then IMC based PID controller was also applied to the model with a 1st order disturbance. The response has no overshoot and takes less settling time as compared to IMC and reduced order IMC. Figure7 shows the response of IMC based PID controller. The step response for a IMC model with a 1st order disturbance is shown in Figure6. The response shows that the IMC has a good performance as compared to PID and PI controllers combined with the Smith predictor. Internal Model Control has been applied for varying time delays.

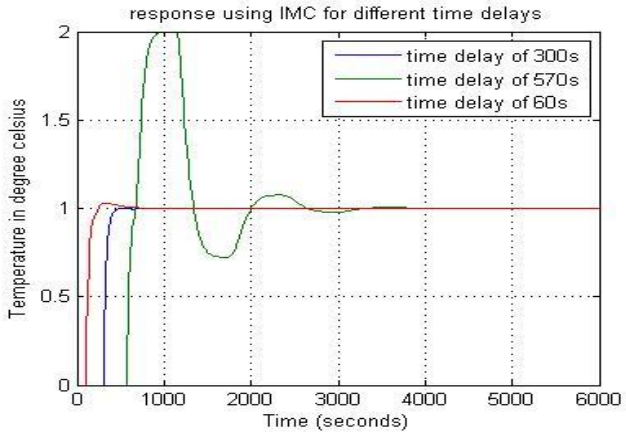

Figure 6: Response of IMC for varying time delays

The responses shows that the IMC controller keep the system robust even if the time delay changes. Fig.6 shows the responses of the IMC model for time delays of 60s, 300s and 570s. For a time delay of 60s there is a small overshoot and has a settling time of 890s, and when the time delay is changed to 300s there is no overshoot and the response settles with a little more time than, when the delay was 60s and the settling time is found to be 950s. But the system robustness was not lost with the changes in time delay. When a time delay of 570s were applied to the system, response began to oscillate and settles within 3200s. But the responses shows a good performance with IMC when compared to the response of the other controllers [6][7] which were done earlier.

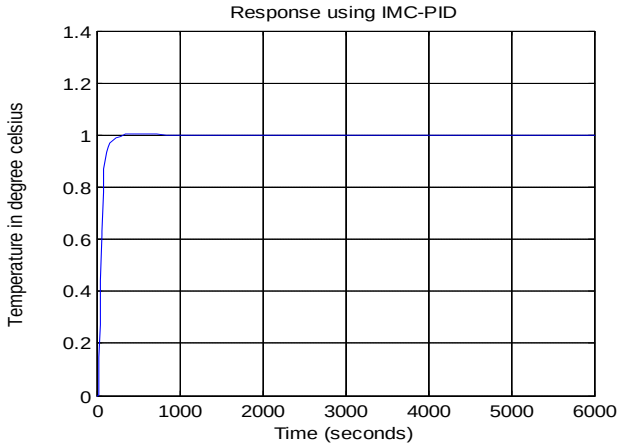

Figure 7: Response of IMC based PID for varying time delays.

Then IMC based PID controller was also applied to the model with a 1st order disturbance. The response has no overshoot and takes less settling time as compared to IMC and reduced order IMC. Figure7.shows the response of IMC based PID controller.

6. Conclusion

The IMC provides a transparent frame works for control system design and tuning. The internal model control design results in only one tuning parameter λ. The IMC based PID tuning parameters are then a function of closed loop time constant. The selection of the closed loop time constant is directly related to the robustness sensitivity. IMC provides a good solution to the process with significant time delays which is actually the case with working in real time environment. The IMC based PID is able to compensate for disturbances and model uncertainty. Thus in varying time delay systems, where robustness with respect to delay variance plays a crucial role, the tuning of λ_{IMC} turns out to be crucial

7. Future Scope

So due to speed in their execution, accuracy of control, ease of configuration, low energy consumption, probability etc, FOPID based IMC should also be applied to the process and tuning rule can be obtained without any approximation for a time delay.

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