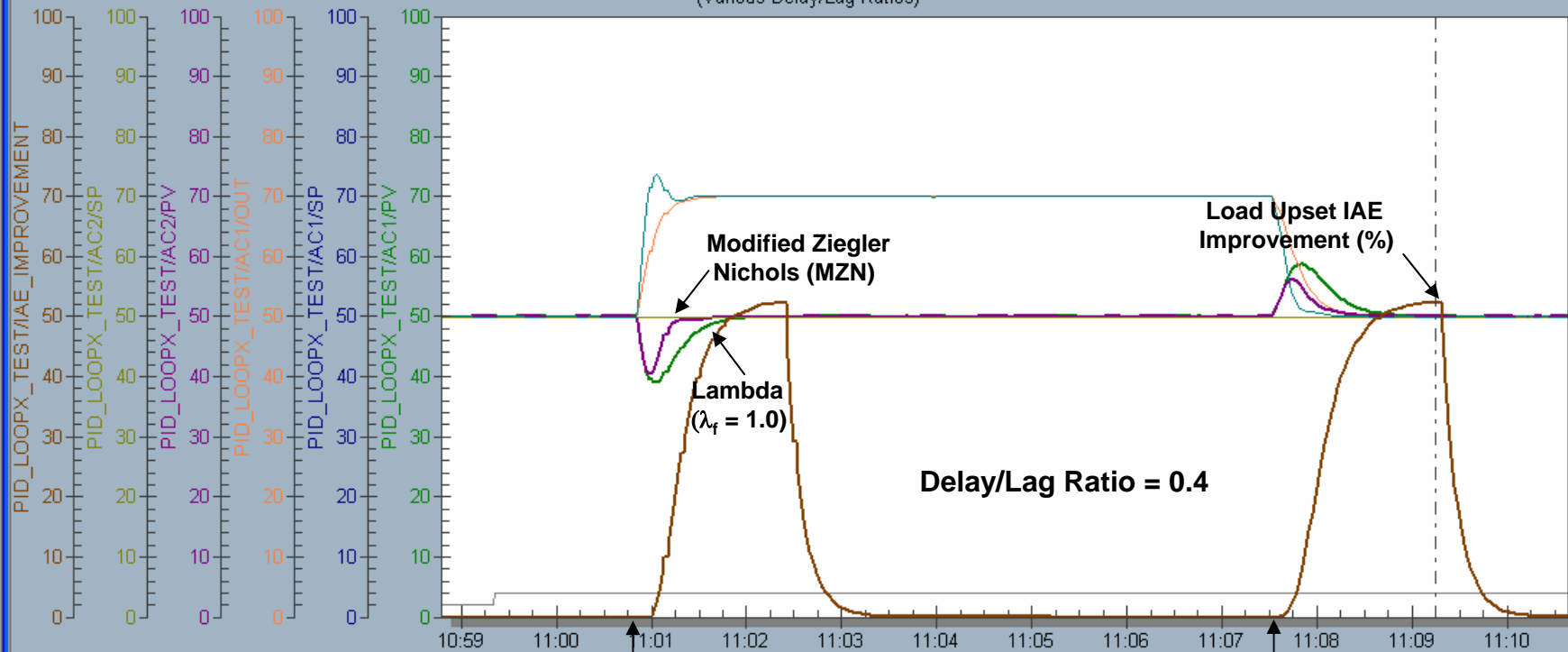


Tuning Rules Test

(Various Delay/Lag Ratios)

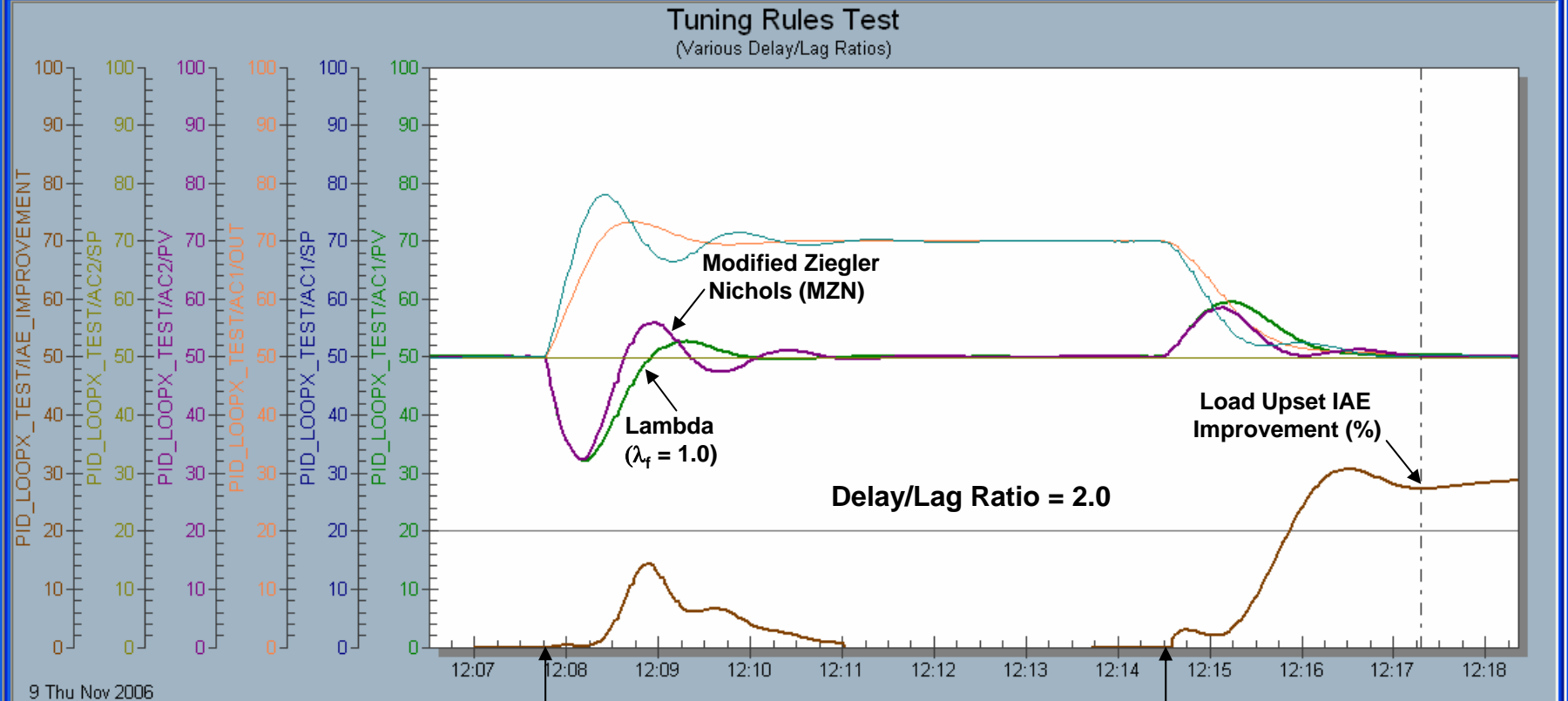


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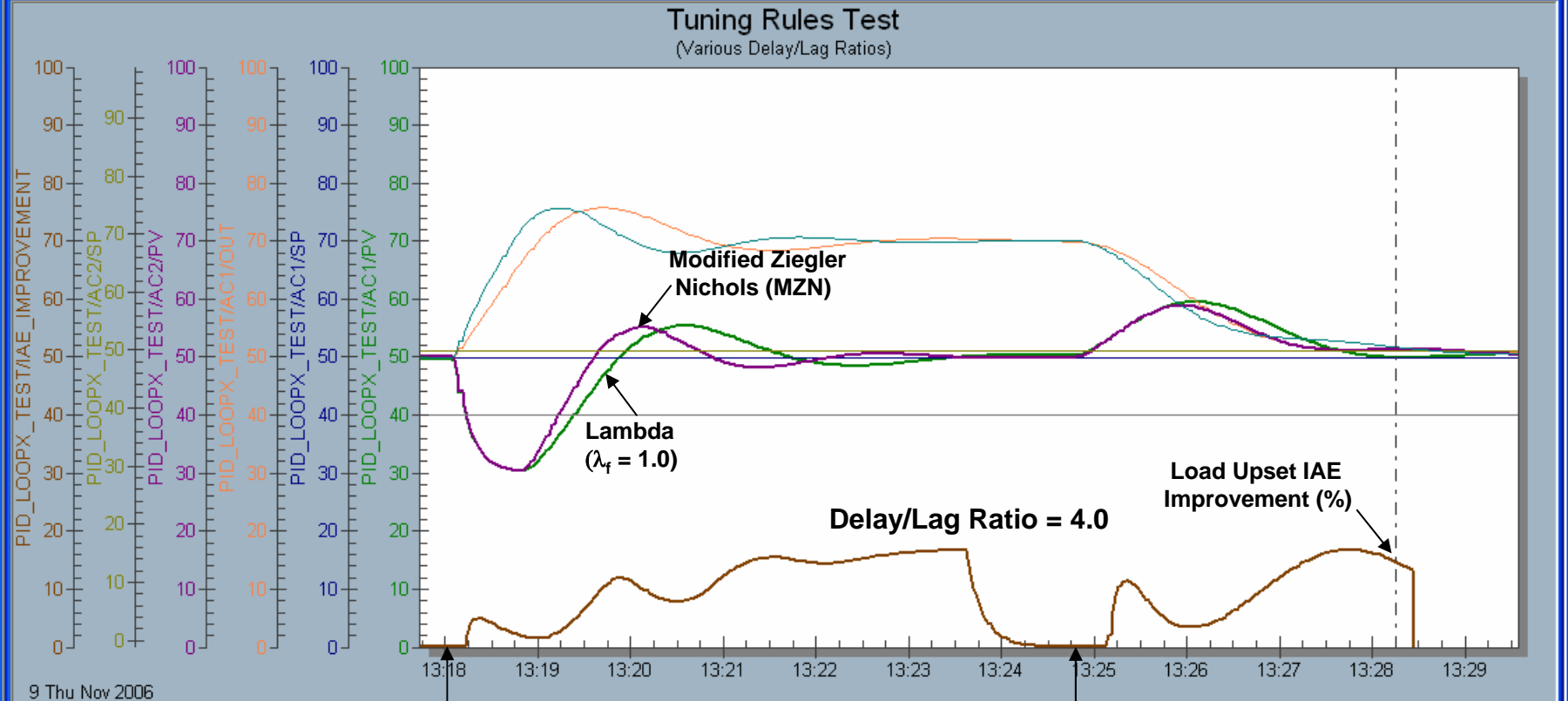
Step Upset

Slow Upset

Parameter Reference	Descriptor	Value	Units	Timestamp
* PID_LOOPX_TEST/AC1/PV		50.05		11/9/2006...
PID_LOOPX_TEST/AC1/SP		50.00		11/9/2006...
PID_LOOPX_TEST/AC1/OUT		49.97		11/9/2006...
* PID_LOOPX_TEST/AC2/PV		50.02		11/9/2006...
PID_LOOPX_TEST/AC2/SP		50.00		11/9/2006...
PID_LOOPX_TEST/AC2/OUT		49.95		11/9/2006...
PID_LOOPX_TEST/PROCESS_DELAY		4.00		11/9/2006...
* PID_LOOPX_TEST/IAE_IMPROVEMENT		52.38		11/9/2006...



Parameter Reference	Descriptor	Value	Units	Timestamp
* PID_LOOPX_TEST/AC1/PV		50.38		11/9/2006...
PID_LOOPX_TEST/AC1/SP		50.00		11/9/2006...
PID_LOOPX_TEST/AC1/OUT		50.35		11/9/2006...
* PID_LOOPX_TEST/AC2/PV		50.00		11/9/2006...
PID_LOOPX_TEST/AC2/SP		50.00		11/9/2006...
PID_LOOPX_TEST/AC2/OUT		50.24		11/9/2006...
PID_LOOPX_TEST/PROCESS_DELAY		20.00		11/9/2006...
* PID_LOOPX_TEST/IAE_IMPROVEMENT		27.27		11/9/2006...



Step Upset Slow Upset

Parameter Reference	Descriptor	Value	Units	Timestamp
* PID_LOOPX_TEST/AC1/PV		49.92		11/9/2006...
PID_LOOPX_TEST/AC1/SP		50.00		11/9/2006...
PID_LOOPX_TEST/AC1/OUT		51.27		11/9/2006...
* PID_LOOPX_TEST/AC2/PV		51.33		11/9/2006...
PID_LOOPX_TEST/AC2/SP		50.00		11/9/2006...
PID_LOOPX_TEST/AC2/OUT		51.75		11/9/2006...
PID_LOOPX_TEST/PROCESS_DELAY		40.00		11/9/2006...
* PID_LOOPX_TEST/IAE_IMPROVEMENT		14.85		11/9/2006...

IAE Improvement from Tuning for Unmeasured Slow Load Upset at Process Input

$$\Delta \text{IAE} \cong 100\% * \left[\left(1.0 - \frac{K_{co}}{K_{cn}} * \frac{T_{in}}{T_{io}} \right) \right]$$

where:

K_{cn} = new controller gain

K_{co} = old controller gain

ΔIAE = IAE improvement from new controller tuning (%)

T_{in} = new controller reset time (seconds)

T_{io} = old controller reset time (seconds)

Above equation is accurate for an over damped response of a PI controller to a slow load upset at the process input