



Monitoramento e Otimização de Malhas de Controle

Agenda

Malhas de Controle

Indicadores

Motivos Comuns

Exemplo

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Motivos Comuns

Exemplo

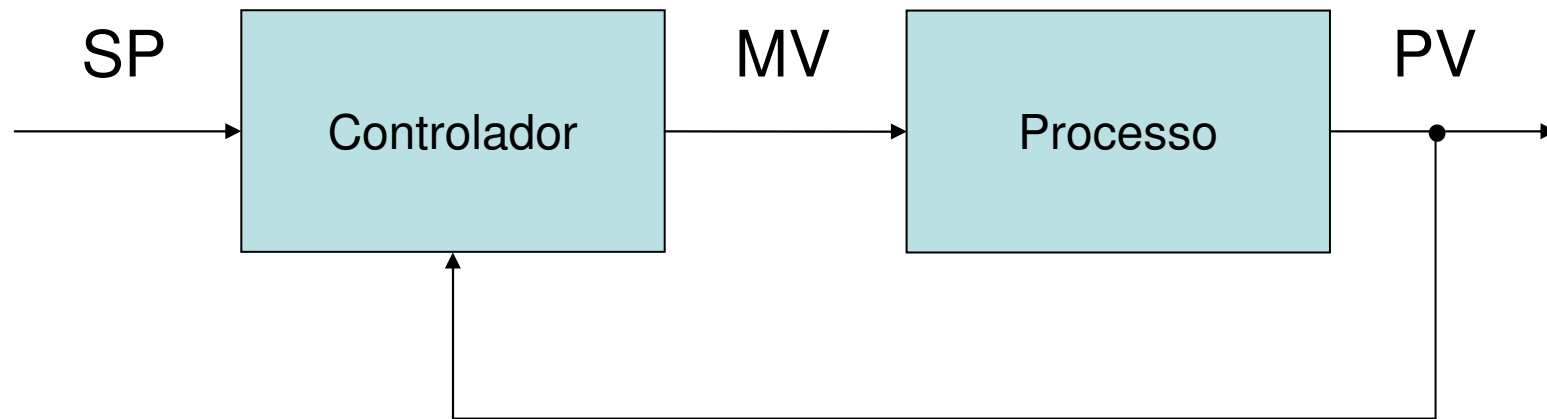
Malhas de Controle

80% Apresentam menor variabilidade trabalhando em manual

30% Apresentam oscilações por não-linearidades

30% Apresentam oscilações por problemas de sintonia

Malhas de Controle



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Ações

Indicadores

% de Limites Excedidos

Ação Reversa

% em Determinado Modo de Operação

Worst Performing Loops

Loop	Loop Description	Priority	% Limits Exceeded	Reversals	% Manual	% Auto	% Cascade	% Shutdown
Loop214		High	100.00	424.00	3.19	92.65	0.00	4.15
Loop216		High	100.00	888.00	3.03	91.28	0.00	5.69
Loop283		High	100.00	3097.00	3.66	91.55	0.00	4.79
Loop205		High	100.00	1462.00	3.43	91.87	0.00	4.71
Loop221		High	100.00	336.00	4.10	89.98	0.00	5.92
Loop222		High	100.00	3679.00	1.47	92.96	0.00	5.57
Loop225		High	100.00	1123.00	2.58	89.25	0.00	8.17
Loop226		High	100.00	2478.00	1.43	87.99	0.00	10.58
Loop228		High	100.00	3708.00	3.65	91.08	0.00	5.27
Loop232		High	100.00	3540.00	3.05	88.89	0.00	8.06
Loop235		High	100.00	3253.00	1.64	95.16	0.00	3.20
Loop236		High	100.00	1301.00	2.91	86.59	0.00	10.50
Loop237		High	100.00	933.00	2.76	91.26	0.00	5.98
Loop239		High	100.00	3455.00	2.02	94.09	0.00	3.89
Loop241		High	100.00	328.00	2.35	94.54	0.00	3.11
Loop242		High	100.00	361.00	3.09	93.25	0.00	3.66
Loop249		High	100.00	2246.00	2.18	91.62	0.00	6.20
Loop254		High	100.00	1296.00	1.47	91.34	0.00	7.18
Loop256		High	100.00	2764.00	1.44	93.34	0.00	5.22
Loop257		High	100.00	597.00	1.39	92.08	0.00	6.53

Shift

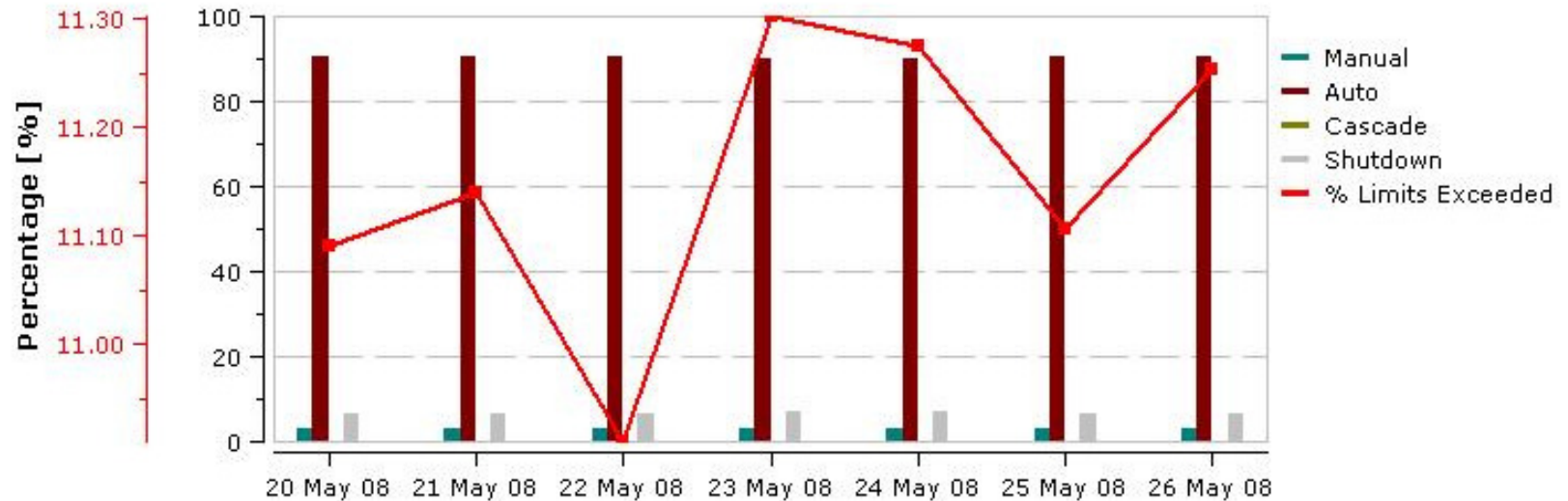
Shift	% Limits Exceeded	% Manual	% Auto	% Cascade	% Shutdown	Shift Comments
Shift 1	12.33	0.71	18.93	0.00	0.00	0
Shift 2	12.33	0.55	19.23	0.00	0.00	0
Shift 3	12.33	0.56	19.13	0.00	0.00	0



Performance Overview : 20 May 2008 - 26 May 2008

Loop: All
 Section: All
 Loop Type: All
 Priority: All

Process Overview



In the Reporting Period

22360	PID Configuration Changes
0	Comments



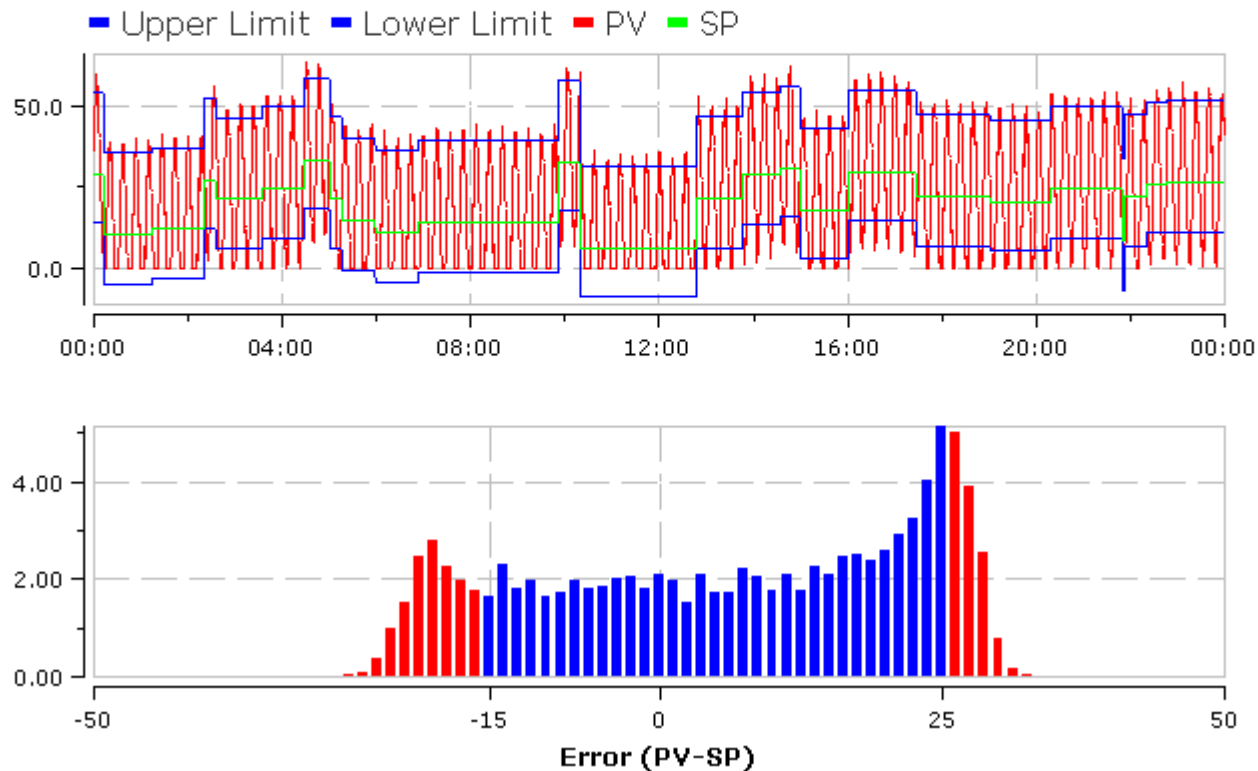
Authorized Distributor

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Erro (PV-SP)

Loop Report : Tuesday, 20 May 2008

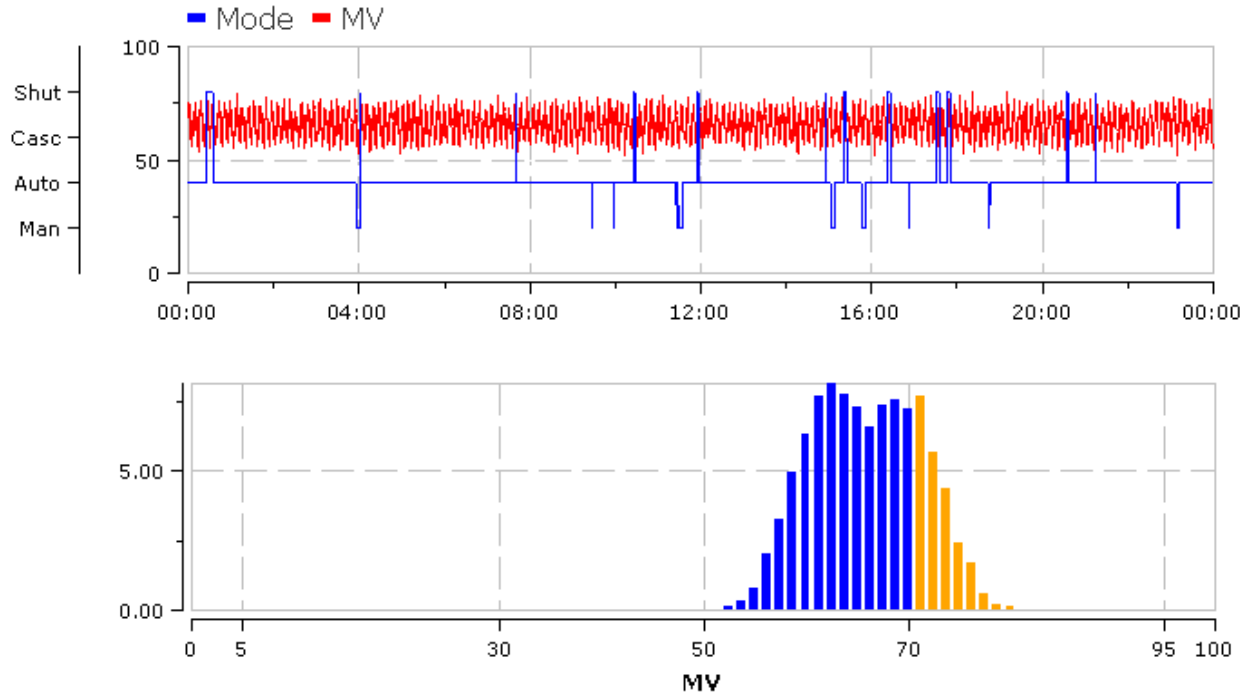
Loop: Loop232 -
Section: SectionType
Loop Type: LoopType
Priority: High



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Distribuição do MV



Mode	#	Duration %	Lower Limit %	Upper Limit %	Total Limits %
Manual	1	2.13	0.12	0.25	0.37
Auto	2	94.34	14.29	13.95	28.24
Cascade	3	0.00	0.00	0.00	0.00
Shutdown	4	3.53	0.66	0.59	1.25

Número de Alterações no Controlador

Controller Performance	
Controller Output [%]	65.962
Movement Index [cycles] / Amplitude [%]	145.61 / 2.55
Reversals [#] / Reversal Amplitude [%]	3560.00 / 4.09
Error Statistics:	
Integrated Error	72517.49
Error Average	6.05
Error Std deviation	16.48

	Proportional	Integral	Derivative	Filter
Before	5.3415	5.8385	3.8055	5.9005
2008-05-20 02:20	5.3415	5.091	3.8055	5.9005
2008-05-20 03:02	3.1505	5.091	3.8055	5.9005
2008-05-20 03:05	3.1505	5.091	0.5795	5.9005
2008-05-20 05:23	0.8505	5.091	0.5795	5.9005
2008-05-20 09:22	0.8505	5.091	0.565	5.9005
2008-05-20 12:18	6.3495	5.091	0.565	5.9005
2008-05-20 13:38	6.3495	7.3725	0.565	5.9005
2008-05-20 15:19	6.3495	7.3725	0.565	3.823
2008-05-20 20:55	6.3495	7.3725	0.565	2.062
2008-05-20 22:25	9.9425	7.3725	0.565	2.062
2008-05-20 23:27	9.9425	7.3725	0.565	7.3255
2008-05-20 23:45	9.9425	7.3725	0.565	1.2005

Loop Statistics	
Sample Period	15
No. of Samples	5760
% Good quality data	84.65
% Time when control on	81.67

Shift

Shift	% Limits Exceeded	% Manual	% Auto	% Cascade	% Shutdown	Shift Comments
Shift 1	0.00	1.04	95.85	0.00	3.12	
Shift 2	0.00	4.59	92.41	0.00	3.00	
Shift 3	0.00	1.04	94.63	0.00	4.33	



Authorized Distributor



Agenda

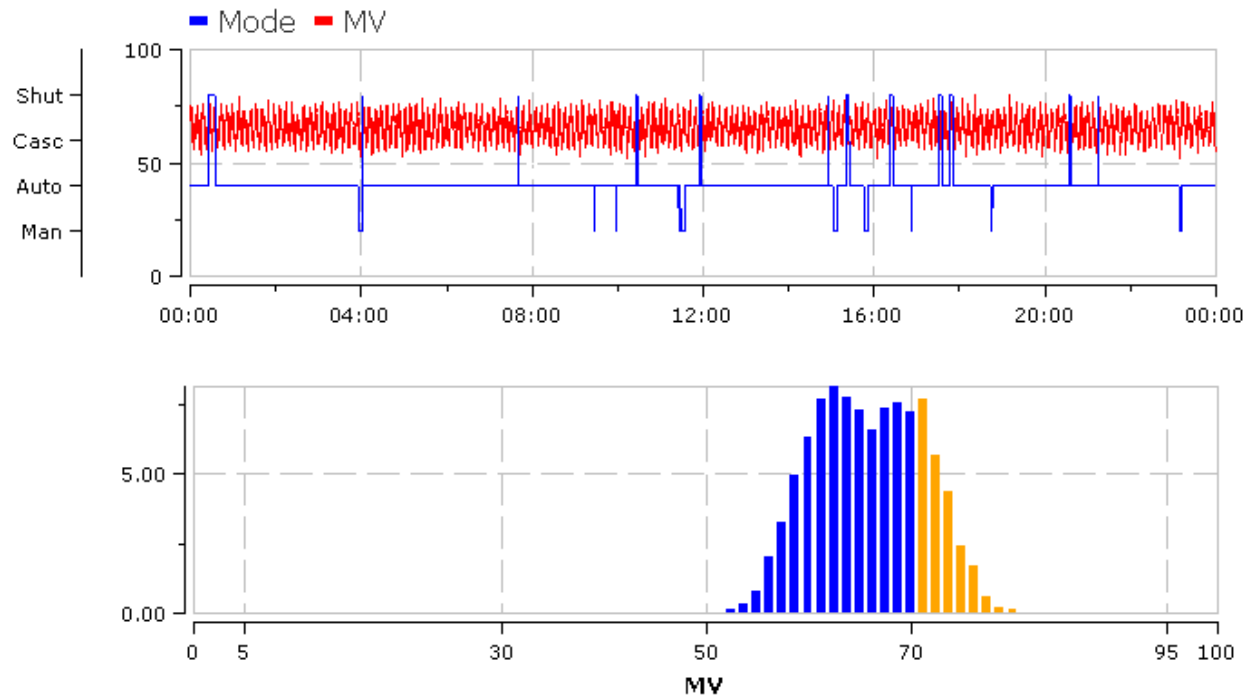
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Exemplo

Instrumentação



Não Linearidades

Correlation Matrix (%)

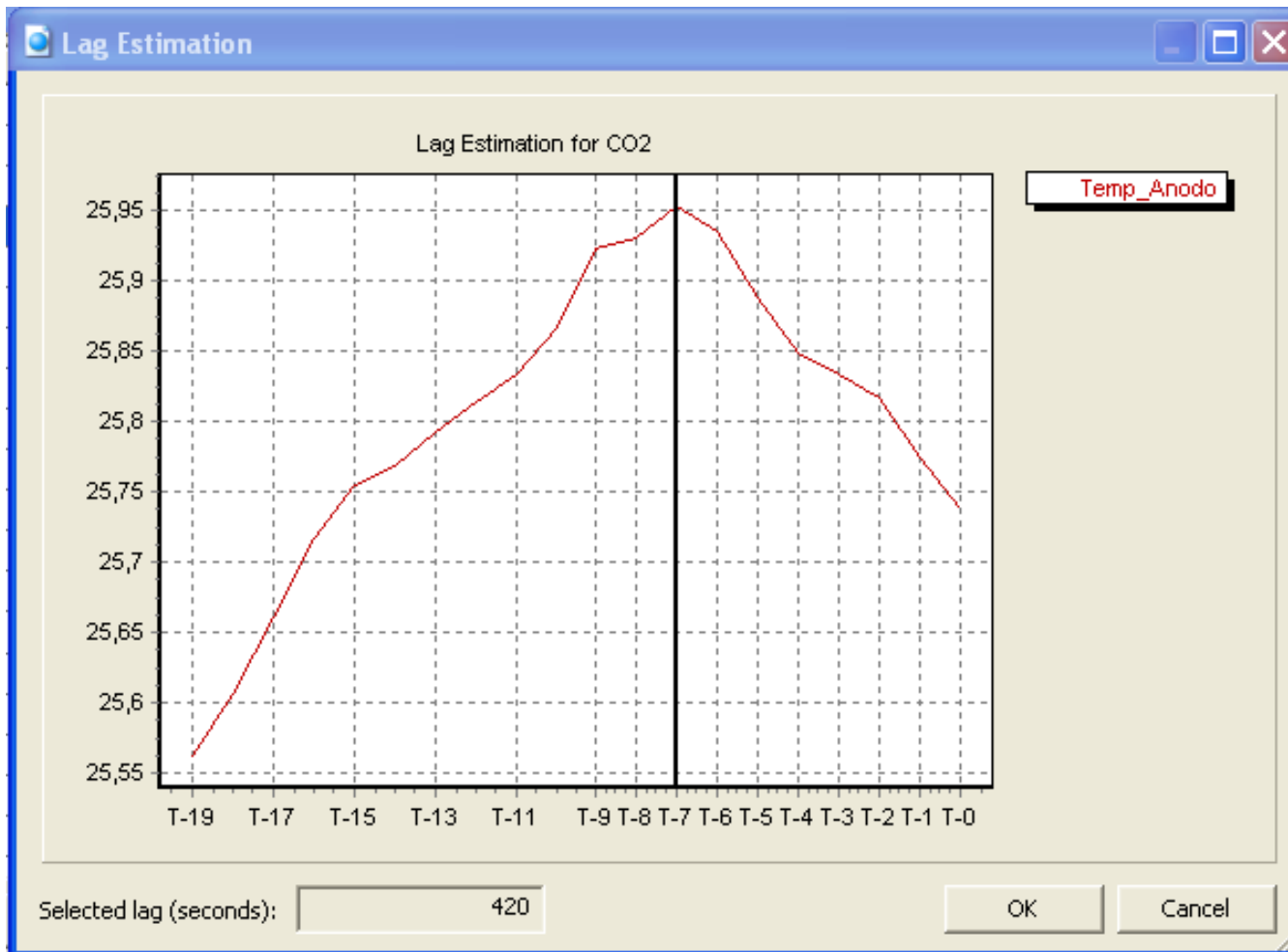
	Camada_Cong	CaO_Vazao	CO	CO2	CrO_Cr2O3	Escoria	FPP	H2	Metal	Minerio_Alum	MVV	Redutor	Temp_Anodo
Camada_Cong	100.00	15.92	22.32	0.08	-32.31	-42.25	20.78	21.47	74.30	19.97	15.19	17.98	47.61
CaO_Vazao	15.92	100.00	72.22	67.02	-21.17	-57.05	94.37	72.18	15.28	92.92	79.66	94.38	43.50
CO	22.32	72.22	100.00	88.74	-18.75	-68.96	77.38	99.68	23.36	77.98	64.15	77.43	51.28
CO2	0.08	67.02	88.74	100.00	3.06	-56.35	68.32	89.45	5.20	69.91	58.26	71.04	38.71
CrO_Cr2O3	-32.31	-21.17	-18.75	3.06	100.00	21.76	-28.00	-17.37	-20.44	-26.45	-20.30	-22.06	-18.41
Escoria	-42.25	-57.05	-68.96	-56.35	21.76	100.00	-60.35	-69.42	-48.08	-59.62	-51.70	-60.56	-91.18
FPP	20.78	94.37	77.38	68.32	-28.00	-60.35	100.00	76.83	19.98	98.89	84.21	98.26	45.64
H2	21.47	72.18	99.68	89.45	-17.37	-69.42	76.83	100.00	22.51	77.43	63.83	77.32	52.08
Metal	74.30	15.28	23.36	5.20	-20.44	-48.08	19.98	22.51	100.00	19.55	15.44	17.07	52.97
Minerio_Alum	19.97	92.92	77.98	69.91	-26.45	-59.62	98.89	77.43	19.55	100.00	84.58	98.44	44.93
MVV	15.19	79.66	64.15	58.26	-20.30	-51.70	84.21	63.83	15.44	84.58	100.00	84.38	42.96
Redutor	17.98	94.38	77.43	71.04	-22.06	-60.56	98.26	77.32	17.07	98.44	84.38	100.00	46.38
Temp_Anodo	47.61	43.50	51.28	38.71	-18.41	-91.18	45.64	52.08	52.97	44.93	42.96	46.38	100.00

Categories

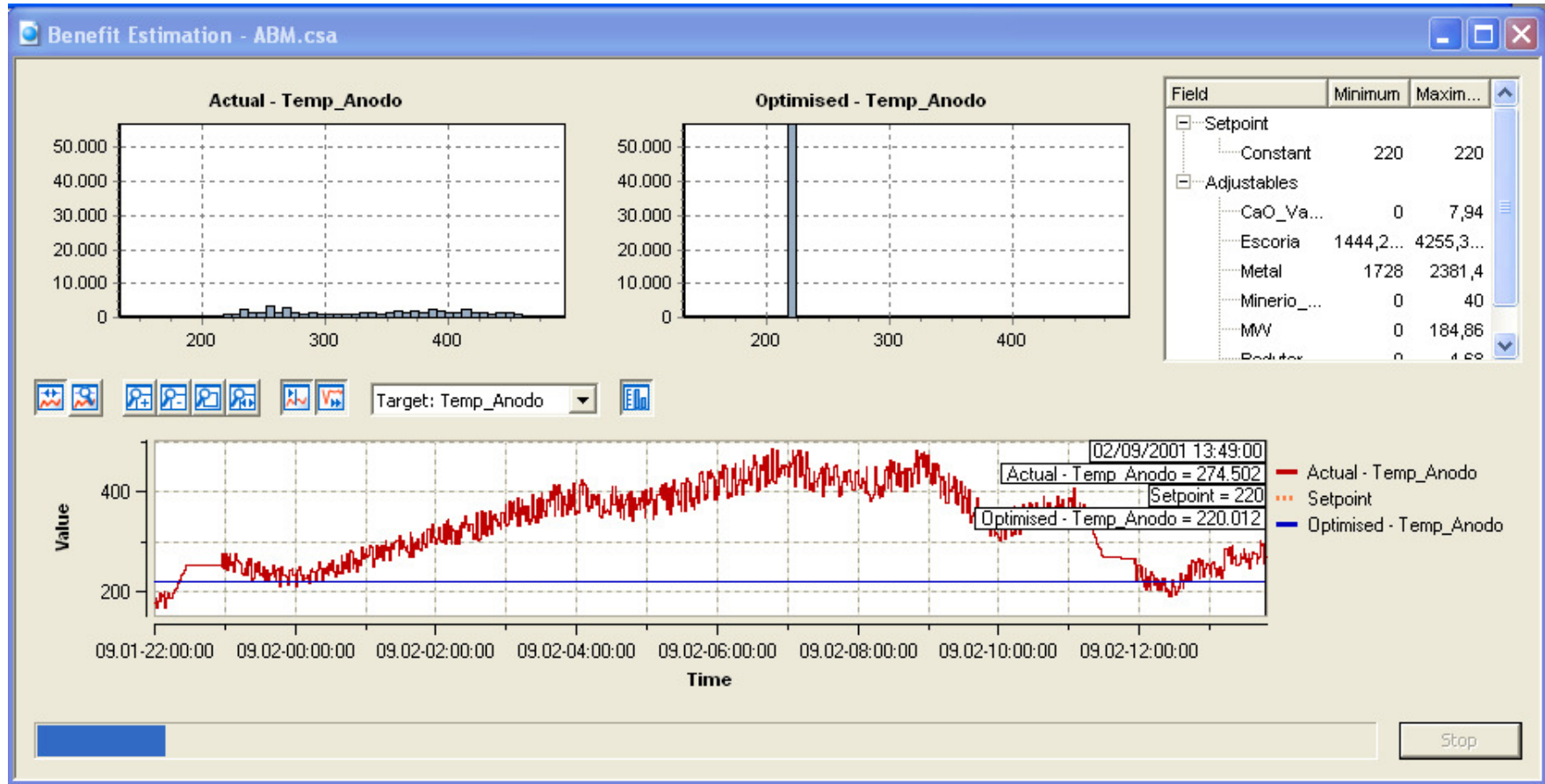
Adjustable Disturbance State Target Undefined

Mark Unmark Clear Export Ranges OK Cancel

Não Linearidades



Capacidade do Processo



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Sintonia do Controlador

- Softwares de sintonia de PID
- Estudo de Parâmetros Baseado em Modelo
- Simulação

Agenda

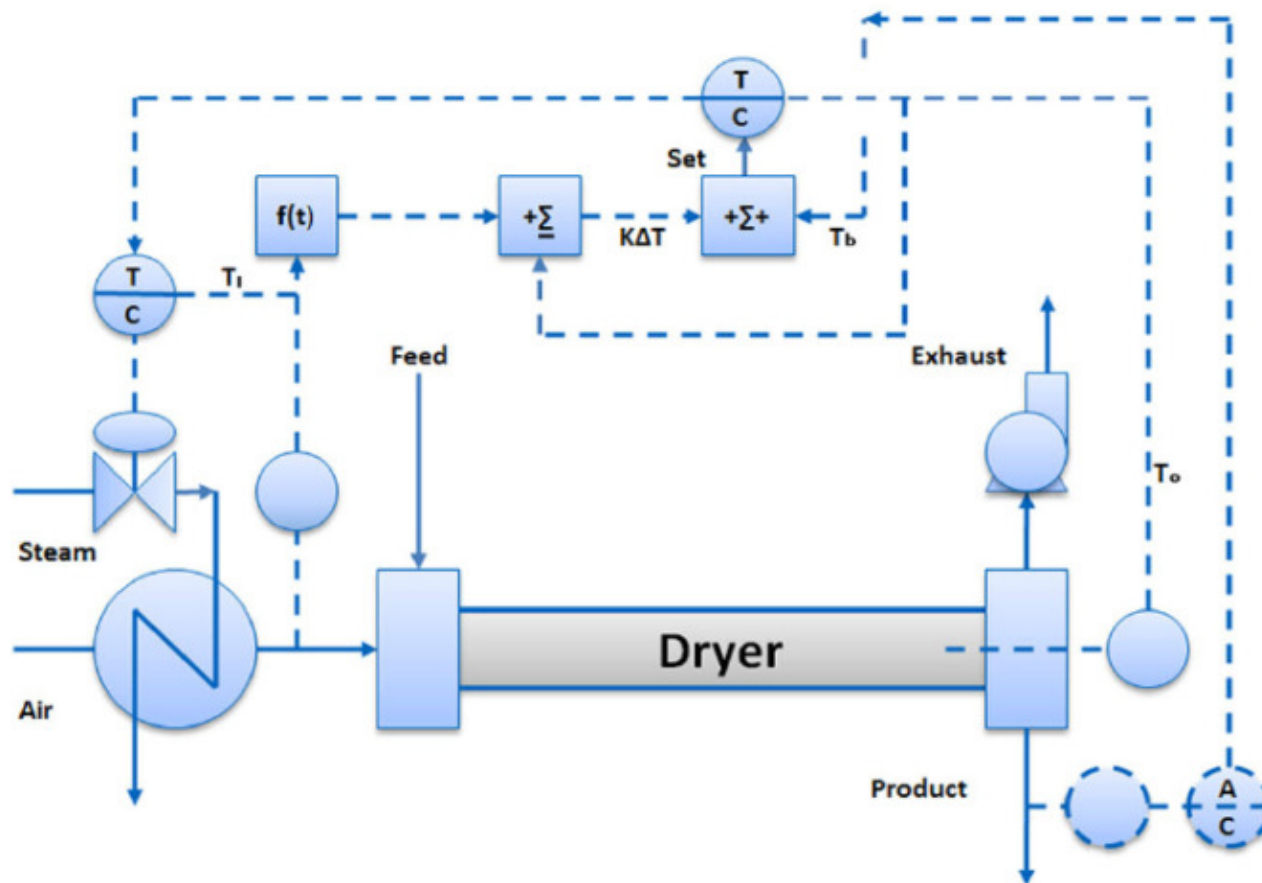
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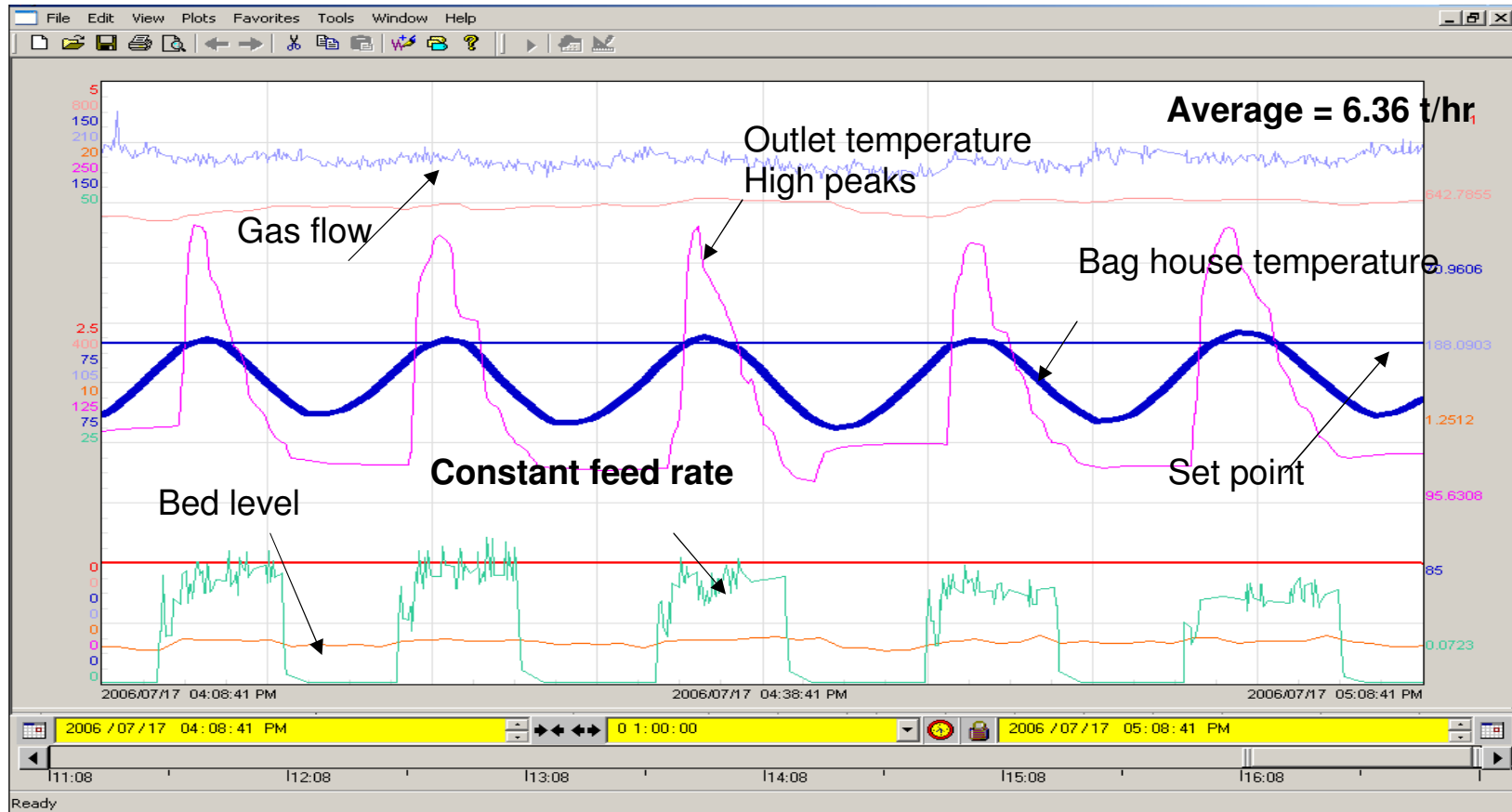
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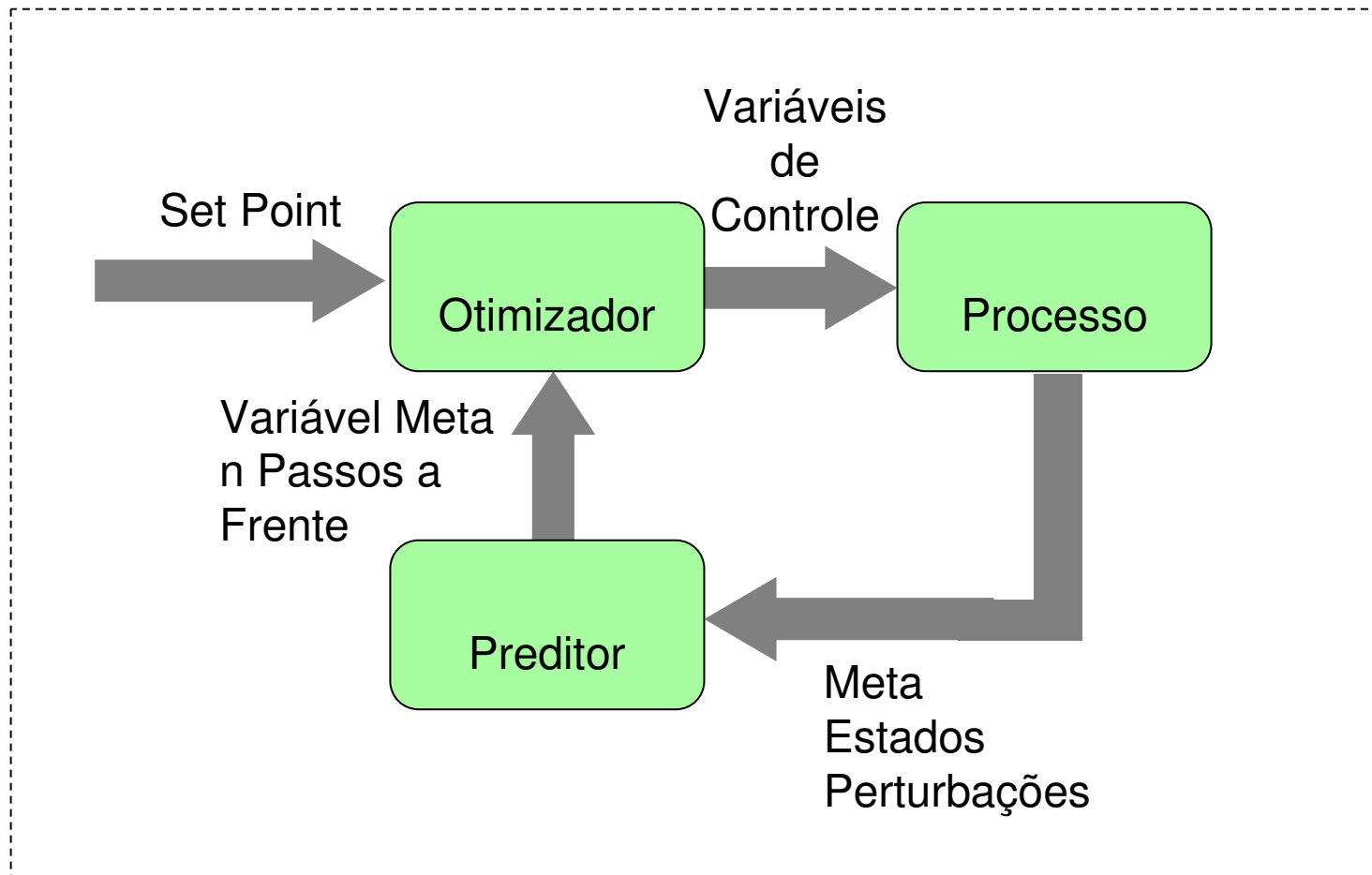
Exemplo



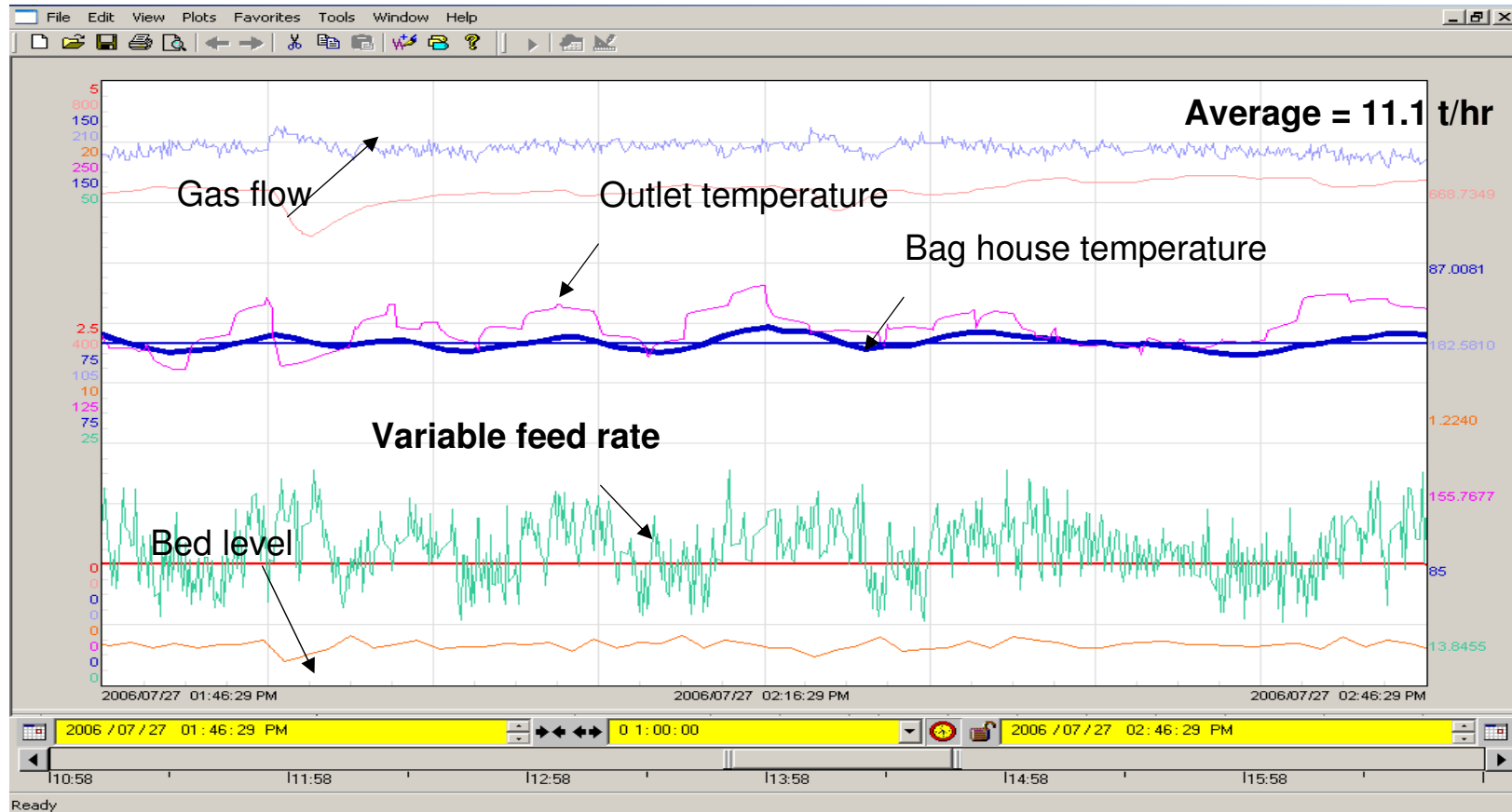
Exemplo



Exemplo



Exemplo



Exemplo

5 - 20% de Ganho

3 - 5% de Redução no Custo de Energia

5 – 10% de Aumento da Produção

Melhoria na Estabilidade



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