



# Regional Seminar Series Charlotte, NC



## The PI System at Mallard Creek Polymers

Mike DeLange, Sr. Process Engineer, Mallard Creek Polymers

November 18, 2010

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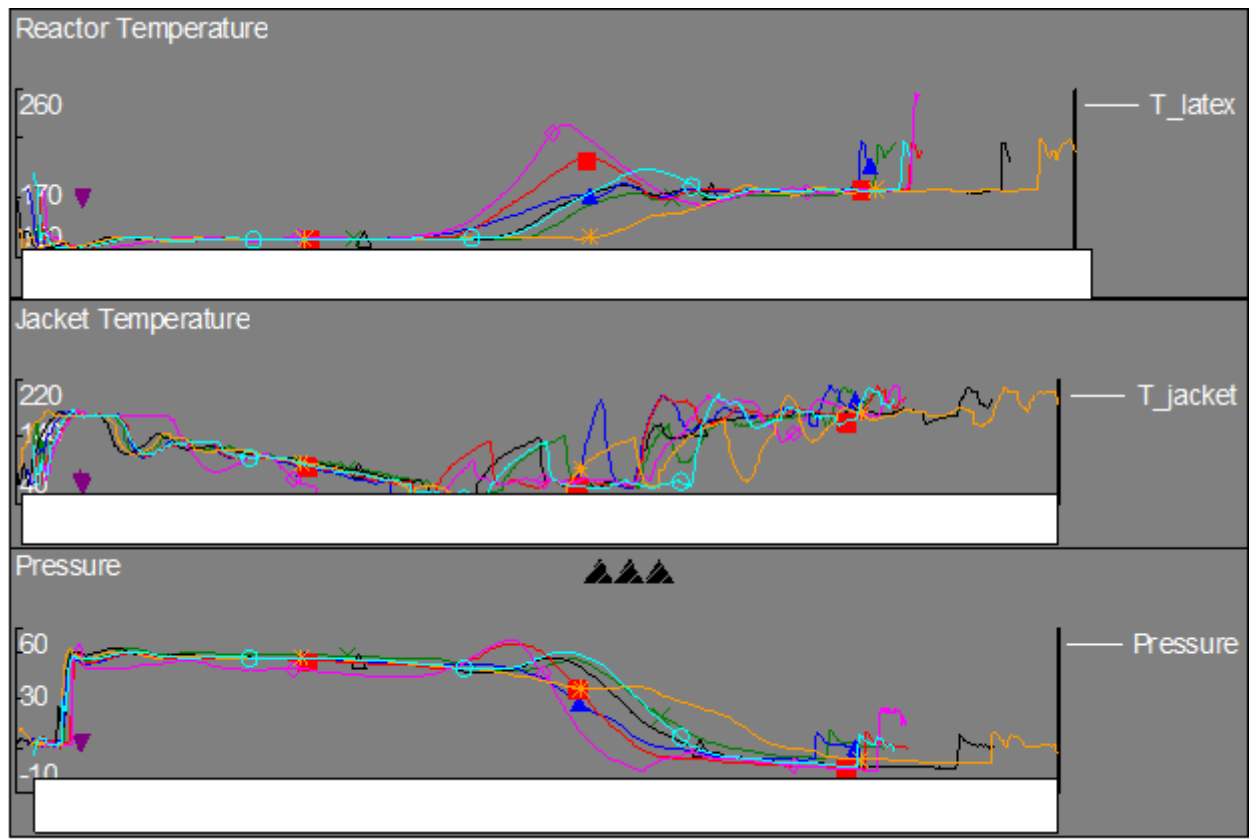
- Who is Mallard Creek Polymers
- Troubleshoot Thick Batch
- Troubleshoot Reactor Solids Issue
- Charge System Report
- Golden Batch Display
- Plant Utilization Display
- Production Shift tag based on time of day
- Testing a Control System Algorithm



- Established 1962 as part of Unocal, now privately owned
- Services various industries, including adhesives, non-woven fabrics, paint & coatings, textile, carpet, sealants, construction and paper.
- Manufactures a broad line of Styrene-Butadiene latex and Acrylic latex
- Products are produced by “batch” processes

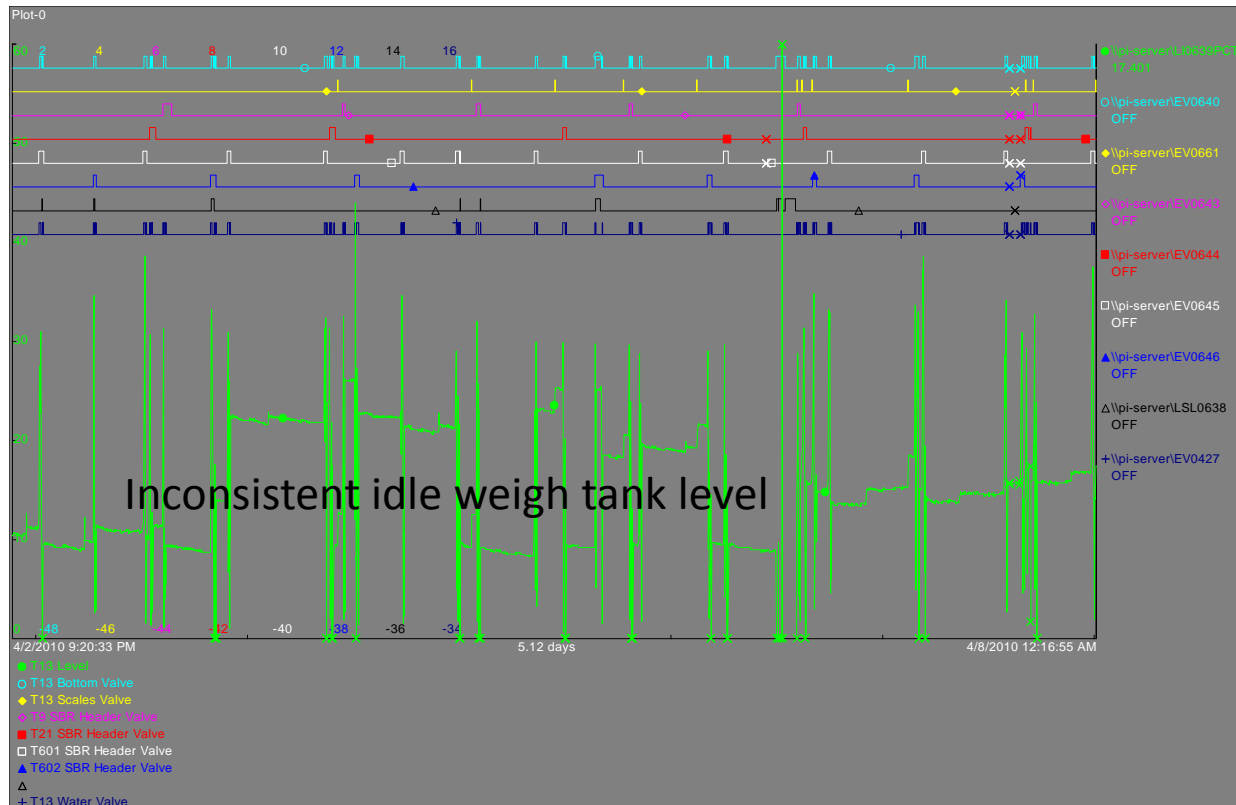
A batch that appeared to run normally according to operators turned into a thick paste and had to be scrapped. (\$30,000)

Used PI Batch and PI DataLink to determine problem was a combination of high 2<sup>nd</sup> Injection temperature combined with low reactor conversion as determined by low pressure loss off of peak pressure



	2nd Inject	2nd Inject
Batch ID	DP From Peak	Temperature
139966	44.1	169.9
139967	21.1	168.8
139994	25.1	179.8
139995	24.1	149
<b>139996</b>	<b>17.3</b>	<b>177</b>
139997	24.2	169.1
139998	28.1	178.8
139999	21	181.7
140009	26.7	168.8
140010	22.6	175.7
140041	43	187.2
140057	37.1	167.1
140058	29.4	176.6
140072	31.9	192.1
140073	26.9	176.1
140090	28.3	169.1
<b>140091</b>	<b>13.5</b>	<b>195.2</b>
140101	28.2	169.3
140102	30	162.1
140103	26.1	168.1
140104	20.6	170.6
<b>140124</b>	<b>42.3</b>	<b>203.4</b>
140150	31.8	179.3
140151	44.9	158.6
140163	25.9	173.6
140166	21.9	168.2
140164	25	167.1
140167	30.4	179.1
140255	54.6	175.9
140256	52.5	179.4
140263	31.9	189

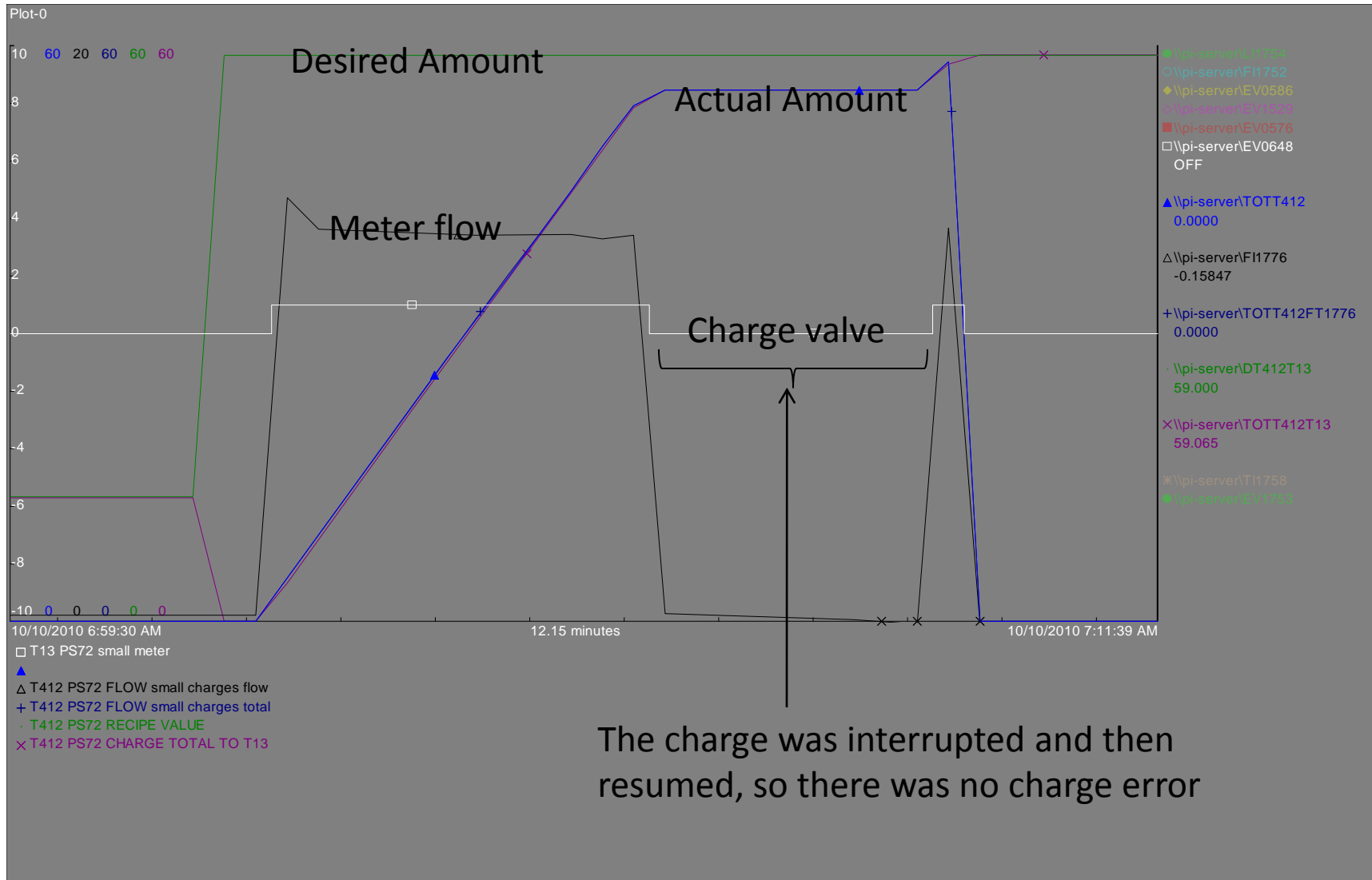
- Started getting variable solids results, some higher than normal, some lower.
- Was causing productivity problems that losses could have cost in the \$100,000's of lost opportunity if not caught early



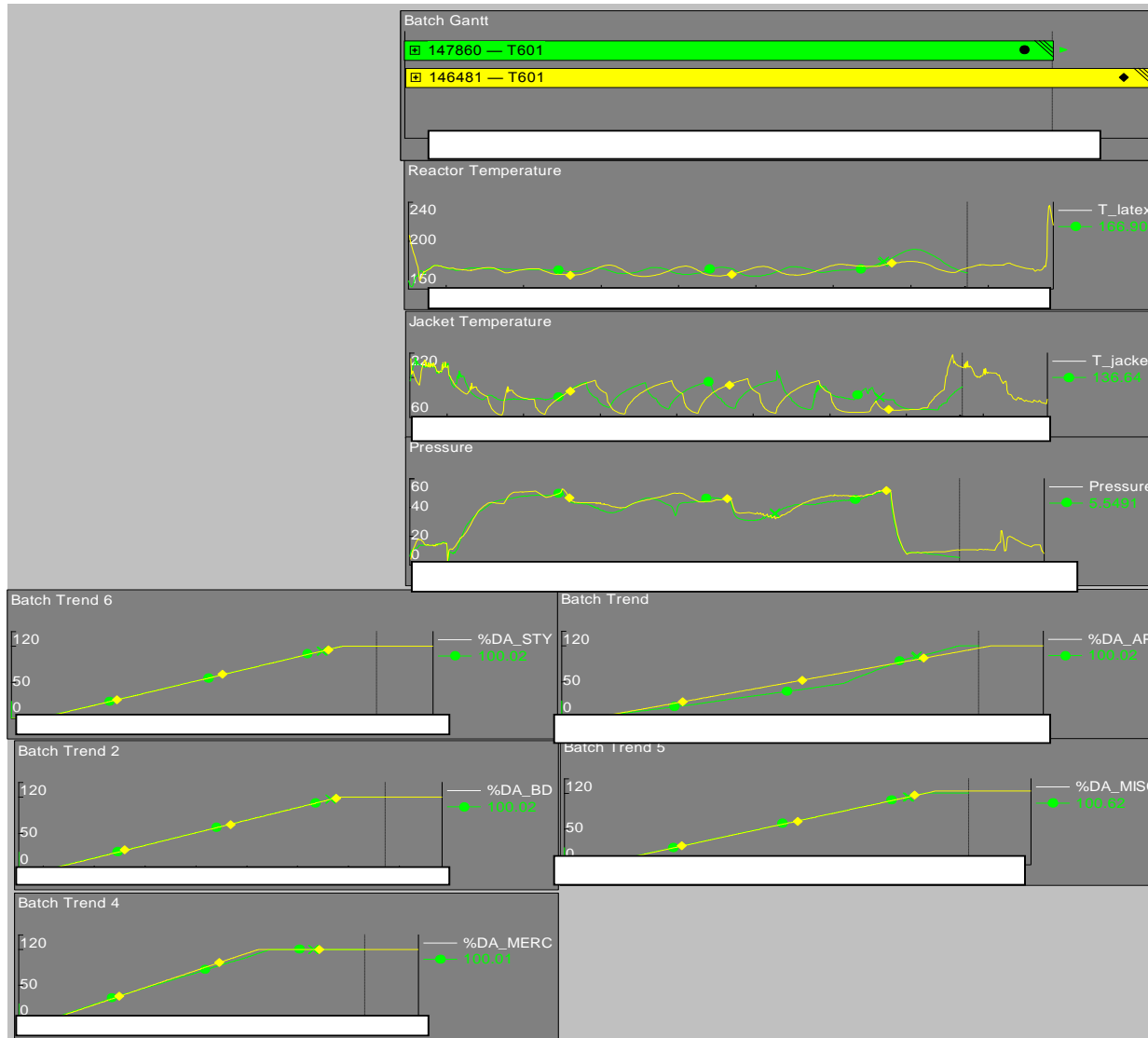
## A Simple PI DataLink Application That Monitors a Charge System

10/14/2010 14:10					Desired amount	Actual amount	Charge error
*-90d					DT412T13	TOTT412T13	
EV0648	'EV0648'='ON'	'EV0648'='OFF'					
Number of Values:	289						
14-Oct-10 07:23:16	ON	14-Oct-10 07:25:36	OFF	14-Oct-10 07:26:06	30	30.113214	-0.11321
13-Oct-10 21:08:35	ON	13-Oct-10 21:10:55	OFF	13-Oct-10 21:11:25	30	29.923716	0.076284
13-Oct-10 10:40:56	ON	13-Oct-10 10:43:56	OFF	13-Oct-10 10:44:26	41	41.422325	-0.42233
13-Oct-10 01:18:56	ON	13-Oct-10 01:21:56	OFF	13-Oct-10 01:22:26	41	41.24356262	-0.24356
12-Oct-10 14:26:16	ON	12-Oct-10 14:28:56	OFF	12-Oct-10 14:29:26	41	41.42487	-0.42487
12-Oct-10 05:18:16	ON	12-Oct-10 05:20:56	OFF	12-Oct-10 05:21:26	41	41.194115	-0.19411
11-Oct-10 20:55:36	ON	11-Oct-10 20:57:56	OFF	11-Oct-10 20:58:26	30	30.11059709	-0.1106
11-Oct-10 13:07:56	ON	11-Oct-10 13:09:56	OFF	11-Oct-10 13:10:26	30	30.40694	-0.40694
11-Oct-10 05:29:56	ON	11-Oct-10 05:31:36	OFF	11-Oct-10 05:32:06	23	23.163601	-0.1636
11-Oct-10 04:01:36	ON	11-Oct-10 04:03:36	OFF	11-Oct-10 04:04:06	30	30.20018	-0.20018
11-Oct-10 01:45:16	ON	11-Oct-10 01:49:36	OFF	11-Oct-10 01:50:06	59	59.164391	-0.16439
10-Oct-10 20:06:15	ON	10-Oct-10 20:08:35	OFF	10-Oct-10 20:09:05	30	30.40140704	-0.40141
10-Oct-10 18:11:55	ON	10-Oct-10 18:13:35	OFF	10-Oct-10 18:14:05	23	23.191683	-0.19168
10-Oct-10 11:26:56	ON	10-Oct-10 11:29:16	OFF	10-Oct-10 11:29:46	30	30.302555	-0.30255
10-Oct-10 07:09:16	ON	10-Oct-10 07:09:36	OFF	10-Oct-10 07:10:06	59	59.065155	-0.06515
<b>10-Oct-10 07:02:16</b>	<b>ON</b>	<b>10-Oct-10 07:06:16</b>	<b>OFF</b>	<b>10-Oct-10 07:06:46</b>	<b>59</b>	<b>55.375889</b>	<b>3.624111</b>
10-Oct-10 04:07:16	ON	10-Oct-10 04:08:16	OFF	10-Oct-10 04:08:46	13	12.903026	0.096974
09-Oct-10 15:21:16	ON	09-Oct-10 15:23:16	OFF	09-Oct-10 15:23:46	30	30.460882	-0.46088
09-Oct-10 12:03:36	ON	09-Oct-10 12:04:16	OFF	09-Oct-10 12:04:46	13	13.367149	-0.36715
09-Oct-10 06:36:16	ON	09-Oct-10 06:38:36	OFF	09-Oct-10 06:39:06	30	30.238873	-0.23887
08-Oct-10 22:00:56	ON	08-Oct-10 22:02:56	OFF	08-Oct-10 22:03:26	30	30.2451	-0.2451
08-Oct-10 17:17:56	ON	08-Oct-10 17:21:36	OFF	08-Oct-10 17:22:06	50	50.424526	-0.42453
08-Oct-10 13:53:56	ON	08-Oct-10 13:55:56	OFF	08-Oct-10 13:56:26	30	30.095119	-0.09512
08-Oct-10 10:02:16	ON	08-Oct-10 10:19:16	OFF	08-Oct-10 10:19:46	218	218.095184	-0.09518
08-Oct-10 04:14:15	ON	08-Oct-10 04:16:35	OFF	08-Oct-10 04:17:05	30	30.184631	-0.18463
07-Oct-10 16:41:55	ON	07-Oct-10 16:44:15	OFF	07-Oct-10 16:44:45	30	30.24501	-0.24501
07-Oct-10 07:58:16	ON	07-Oct-10 08:01:16	OFF	07-Oct-10 08:01:46	41	41.258389	-0.25839
06-Oct-10 23:04:16	ON	06-Oct-10 23:06:56	OFF	06-Oct-10 23:07:26	37	37.394436	-0.39444
06-Oct-10 20:53:36	ON	06-Oct-10 20:56:16	OFF	06-Oct-10 20:56:46	41	40.955662	0.044338
06-Oct-10 19:03:36	ON	06-Oct-10 19:05:36	OFF	06-Oct-10 19:06:06	23	22.89150153	0.108498
06-Oct-10 10:10:36	ON	06-Oct-10 10:13:56	OFF	06-Oct-10 10:14:26	41	40.920235	0.079765
06-Oct-10 08:24:56	ON	06-Oct-10 08:26:56	OFF	06-Oct-10 08:27:26	23	22.931166	0.068834
06-Oct-10 01:18:56	ON	06-Oct-10 01:22:16	OFF	06-Oct-10 01:22:46	41	40.953415	0.046585

Potential problem

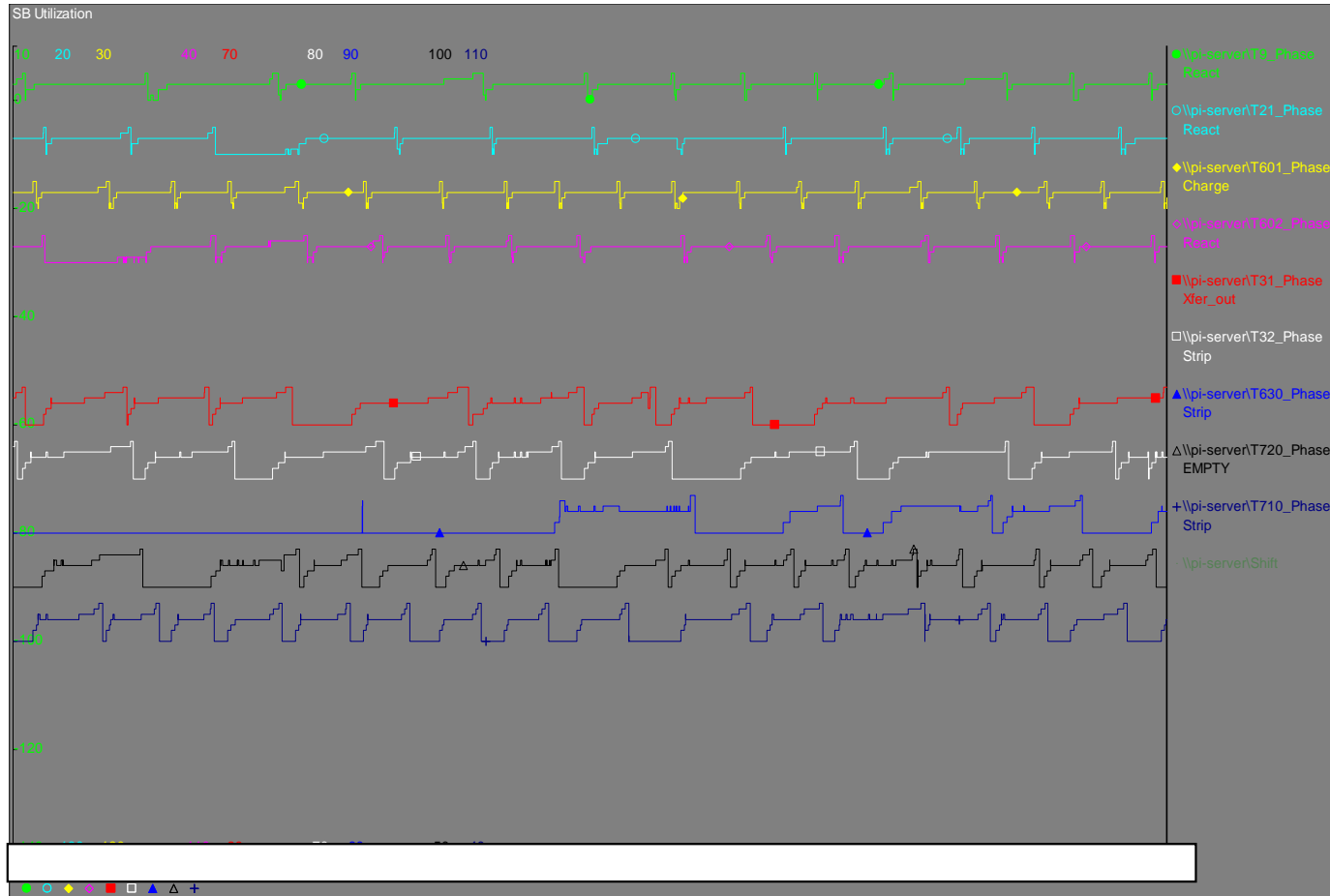




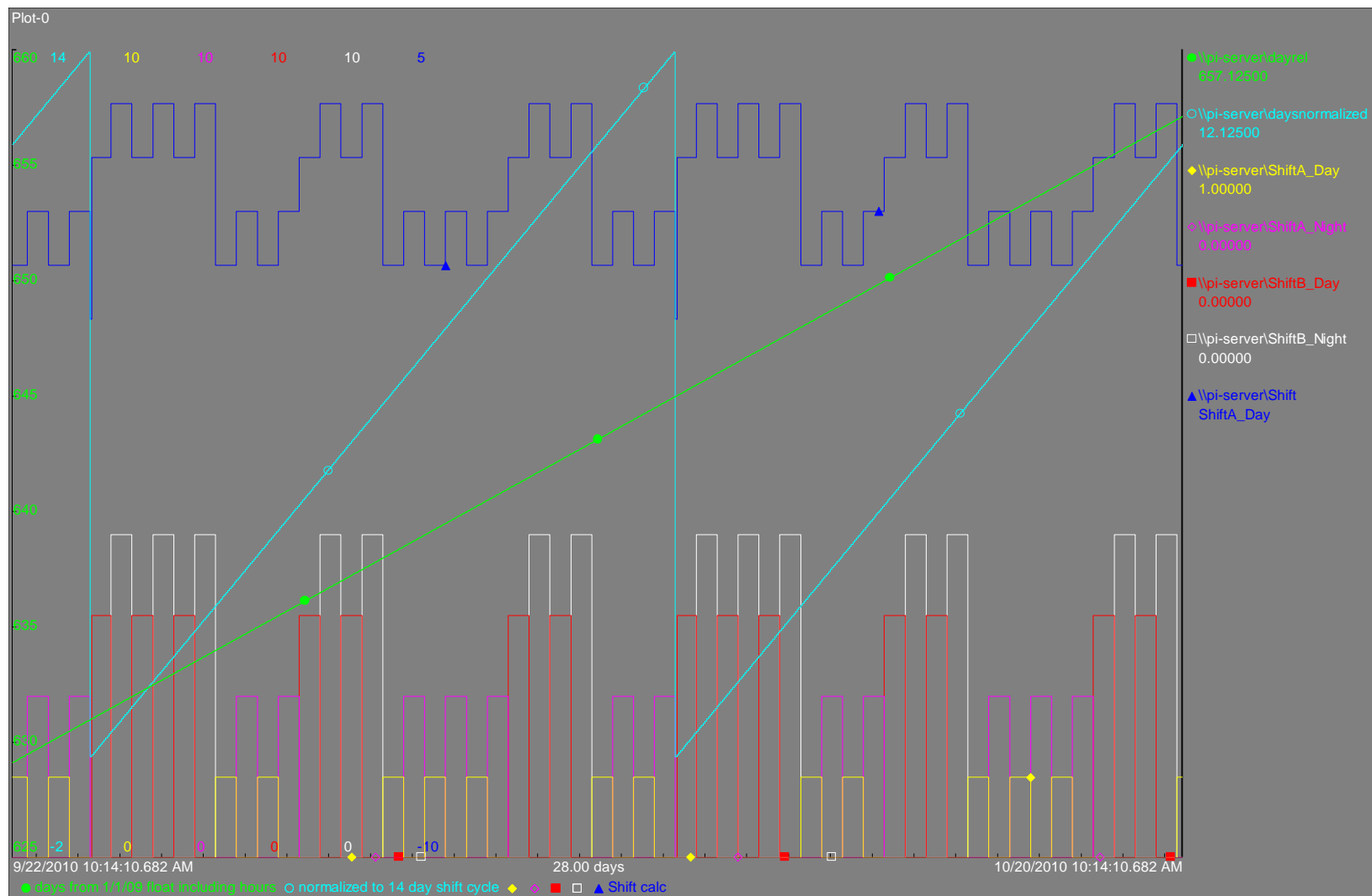


Typical batch is yellow  
current batch is green

## Status of production vessels



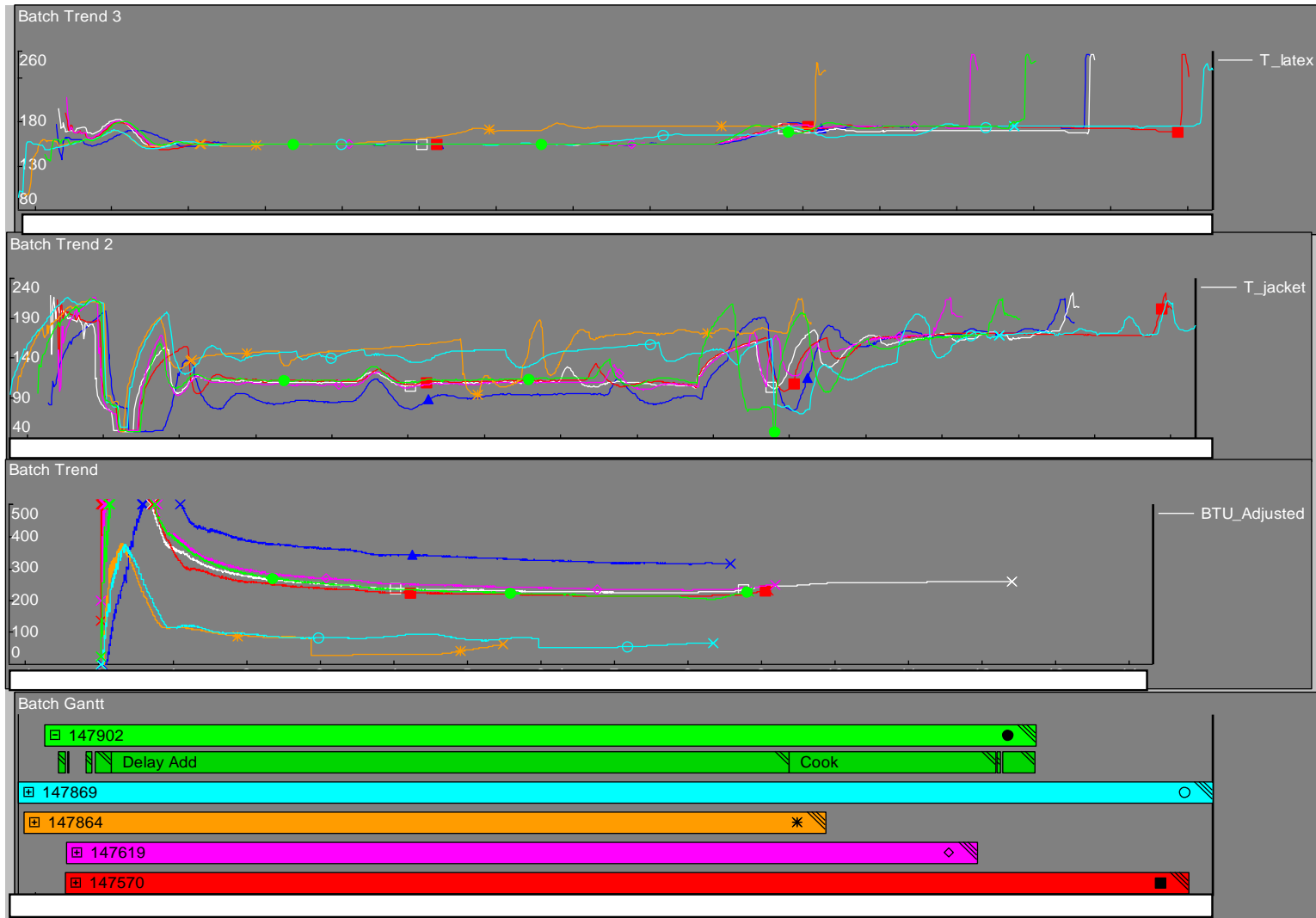
# Operating Shift Calculation Display



Select (x)	Tag	descriptor	digitalset	exdesc
x	Shift	Shift calc	SHIFTSTATE	('ShiftA_Day'+ShiftA_Night'+ShiftB_Day'+ShiftB_Night')
x	ShiftA_Day			#####
x	ShiftA_Night			#####
x	ShiftB_Day			#####
x	ShiftB_Night			#####
x	y2013shift	leap year adjustment		If Year('*') < 2013 Then 0 Else 1
x	y2017shift	leap year adjustment		If Year('*') < 2017 Then 0 Else 1
x	y2021shift	leap year adjustment		If Year('*') < 2021 Then 0 Else 1
x	daysnormalized	normalized to 14 day shift cycle		('dayrel'/14-Trunc((Trunc('dayrel')/14-.01)))*14-1
x	dayrel	days from 1/1/09 float including hours		Yearday('*')+(Year('*')-2009)*365+'y2013shift'+y2017shift'+y2021shift'+(Hour('*')-7)/24-1

## Exdesc for ShiftA\_Day

- If (('daysnormalized' >= 3.0 and 'daysnormalized' < 3.5) or ('daysnormalized' >= 4.0 and 'daysnormalized' < 4.5) or ('daysnormalized' >= 7.0 and 'daysnormalized' < 7.5) or ('daysnormalized' >= 8.0 and 'daysnormalized' < 8.5) or ('daysnormalized' >= 9.0 and 'daysnormalized' < 9.5) or ('daysnormalized' >= 12.0 and 'daysnormalized' < 12.5) or ('daysnormalized' >= 13.0 and 'daysnormalized' < 13.5)) then 1 else 0





Thank you

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