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Advanced Equipment Control/Advanced Process Control

## **AEC/APC Symposium XIV**

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Cliff Lodge and Conference Center • Snowbird, Utah

# Increasing Productivity by Linking Data Sources in Diffusion Area

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# Diffusion Thermco Tools and Processes



<b>Workcell</b>	<b>Tool Count</b>	<b>Process Instance</b>
<b>Fab 1 South</b>	<b>24</b>	<b>370</b>
<b>Fab 1 North</b>	<b>20</b>	<b>261</b>
<b>Fab 1 East</b>	<b>24</b>	<b>538</b>
<b>Fab 2/3</b>	<b>4</b>	<b>68</b>

<b>Focus Area</b>	<b>Tool Count</b>	<b>Process Instance</b>
<b>Al Drive</b>	<b>3</b>	<b>18</b>
<b>BBr3</b>	<b>4</b>	<b>16</b>
<b>Clean Ox</b>	<b>15</b>	<b>314</b>
<b>Drive</b>	<b>7</b>	<b>122</b>
<b>Drive N type</b>	<b>7</b>	<b>107</b>
<b>Drive P type</b>	<b>7</b>	<b>157</b>
<b>Doped Ox</b>	<b>11</b>	<b>298</b>
<b>Gate/Sac</b>	<b>5</b>	<b>71</b>
<b>Other</b>	<b>2</b>	<b>6</b>
<b>POCL</b>	<b>4</b>	<b>28</b>
<b>POCL HT</b>	<b>4</b>	<b>88</b>
<b>POLY</b>	<b>3</b>	<b>12</b>

# Types of Entity Status Data

## Tool Level Data

- Running/ Idle
- Time Remaining
- Alerts / Alarms
- JGA File Id
- Time of Completion

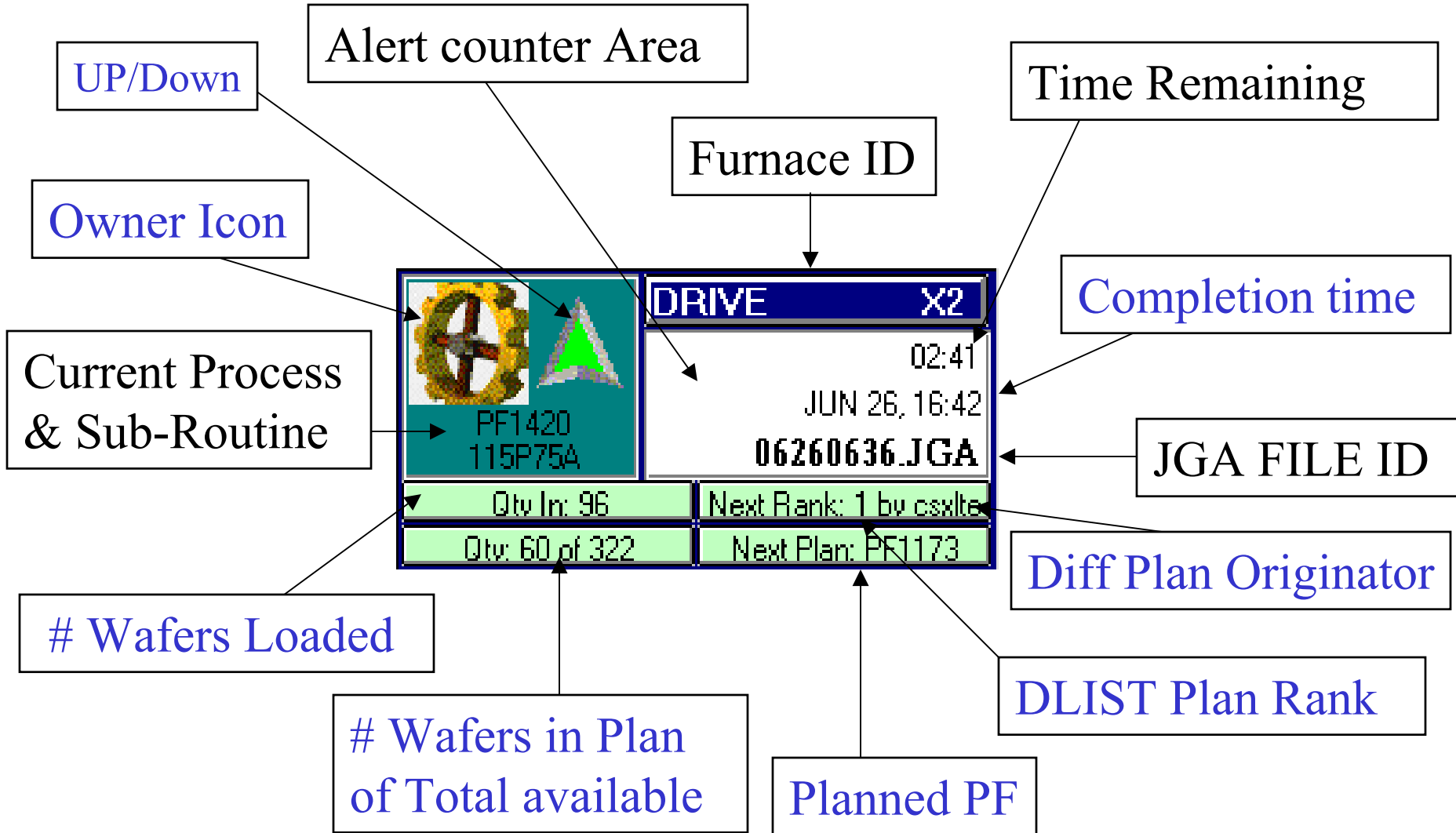
## Logistical Data

- ✓ Ownership (Prod, Eng, Mnt)
- ✓ Entity Availability (Up/Down)
- ✓ Product Wafers Quantity Running
- ✓ Next planned (PF, Qual, SWR, ect.)
- ✓ Quantity Next PF of Total
- ✓ Rank of Next PF



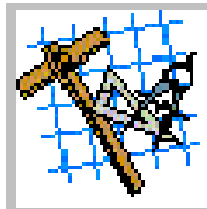
**Grouped by Focus Area  
or Work cell**

# New Bayview Breakdown (New Data in Blue)

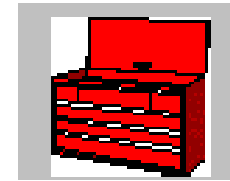


# Workstream “Ownership” Icons



**Production**  
Running = Spinning or  
Stationary when IDLE



Engineering



Maintenance

  <p>PF1420 115P75A</p>	<p><b>DRIVE</b> <b>X2</b></p> <p>02:41</p> <p>JUN 26, 16:42</p> <p><b>06260636.JGA</b></p>	
	Qty In: 96	Next Rank: 1 by csxlte
Qty: 60 of 322	Next Plan: PF1173	



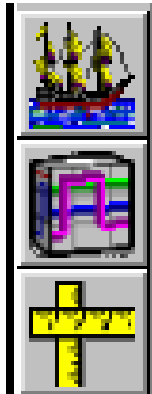
# East Work cell View Bayview Screen



Fab 1 East Workcell Filer - BayView												
Options Help												
	 <Idle> SPVTEST 07081905.IDL 00:00 Qty In: (Not Set) Next Rank: 1 by ctmite Qty: 217 of 959 Next Plan: PF1517	 <Idle> FLAGCLR 07081857.IDL 00:00 Qty In: (Not Set) Next Rank: 3 by csdbte Qty: 192 of 507 Next Plan: PF1503	 PF1407 S-1407C P DRIVE U1 02:14 JUL 08, 22:20 07081654.JGA Qty In: 30 Next Rank: bv of 381 Next Plan: NO PLAN	 PF1276 S-1276A AL DRIVE V3 18:32 JUL 08, 20:25 07081755.JGA Qty In: 72 Next Rank: bv of 36 Next Plan: NO PLAN	 PF1332 95S858 DOPED OX R2 01:28 JUL 08, 20:08 07081817.JGA Qty In: 72 Next Rank: 1 by dlis Qty: 217 of 945 Next Plan: PF1517	 <Idle> FLAGCLR 07081859.IDL 00:00 Qty In: (Not Set) Next Rank: 1 by dlis Qty: 48 of 483 Next Plan: PF1198	 PF1320 BIN09S P DRIVE U2 10:27 JUL 09, 06:33 07081950.JGA Qty In: 84 Next Rank: bv of 213 Next Plan: NO PLAN	 <Idle> STANDBY SILICIDE V4 30:00 JUL 08, 20:37 07081230.IDL Qty In: (Not Set) Next Rank: bv of (Not Set) Next Plan: NO PLAN	 PF1246 95S80C DOPED OX R3 54:38 JUL 08, 21:01 07081643.JGA Qty In: 96 Next Rank: 1 by ctmite Qty: 217 of 873 Next Plan: PF1517	 <Idle> FLAGCLR 07081926.IDL 00:00 Qty In: (Not Set) Next Rank: 6 by csdbte Qty: 52 of 634 Next Plan: PF1200	 PF1510 S-1510C CLEAN OX U3 03:35 JUL 08, 20:10 07081704.JGA Qty In: 99 Next Rank: bv of 724 Next Plan: NO PLAN	 PF1189 95S80C N DRIVE X1 01:48 JUL 08, 20:08 07080854.JGA Qty In: 72 Next Rank: 1 by dlis Qty: 240 of 310 Next Plan: PF1189
	 PF1517 BIN07R DOPED OX R4 03:40 JUL 08, 20:10 07081934.JGA Qty In: 48 Next Rank: bv of 897 Next Plan: NO PLAN	 <Idle> FLAGCLR 07082003.IDL 00:00 Qty In: 72 Next Rank: 1 by dlis Qty: 48 of 622 Next Plan: PF1198	 PF1188 S-H1188C CLEAN OX U4 03:32 JUL 08, 20:10 07081731.JGA Qty In: 144 Next Rank: bv of 634 Next Plan: NO PLAN	 <Idle> PF1175 DRIVE X2 00:00 Qty In: 48 Next Rank: 3 by csxite of 144 Next Plan: PF1172	 PF1402 BIN07R CLEAN OX S1 02:14 JUL 08, 20:09 07081956.JGA Qty In: 38 Next Rank: bv of 507 Next Plan: NO PLAN	 PF1216 85S90A DOPED OX T3 01:41 JUL 08, 21:47 07081855.JGA Qty In: 48 Next Rank: 1 by dlis Qty: 24 of 390 Next Plan: PF1257	 internal internal AL DRIVE V1 08:00 JUL 08, 20:15 07081210.JGA Qty In: (Not Set) Next Rank: bv of 36 Next Plan: MAINT	 <Idle> PF1031 CLEAN OX X3 00:00 Qty In: (Not Set) Next Rank: 2 by csdbte Qty: 69 of 532 Next Plan: PF1196				
	 <Idle> FLAGCLR 07081942.IDL 00:00 Qty In: (Not Set) Next Rank: 1 by dlis Qty: 48 of 577 Next Plan: PF1198	 PF1166 90S80A DOPED OX T4 48:31 JUL 08, 20:55 07081800.JGA Qty In: 143 Next Rank: 1 by dlis Qty: 100 of 149 Next Plan: PF1557	 PF1243 S-1243C AL DRIVE V2 22:58 JUL 08, 20:29 07081818.JGA Qty In: 96 Next Rank: bv of 36 Next Plan: NO PLAN	 PF1198 BIN09S CLEAN OX X4 03:25 JUL 08, 20:10 07081952.JGA Qty In: 108 Next Rank: bv of 532 Next Plan: NO PLAN								

# Bayview Buttons

## JGA Supplied



Historical Graphs

Current Graph

Current Report

## NSTE Developed



Wafers in Tube (Lot, Qty, ...)

Wafers in Like Tubes

Candidate wafers by Tube (DLIS)

Scheduled Quals by Tube

History by Tube (last 24 hours)

Inventory in Diffusion by PF

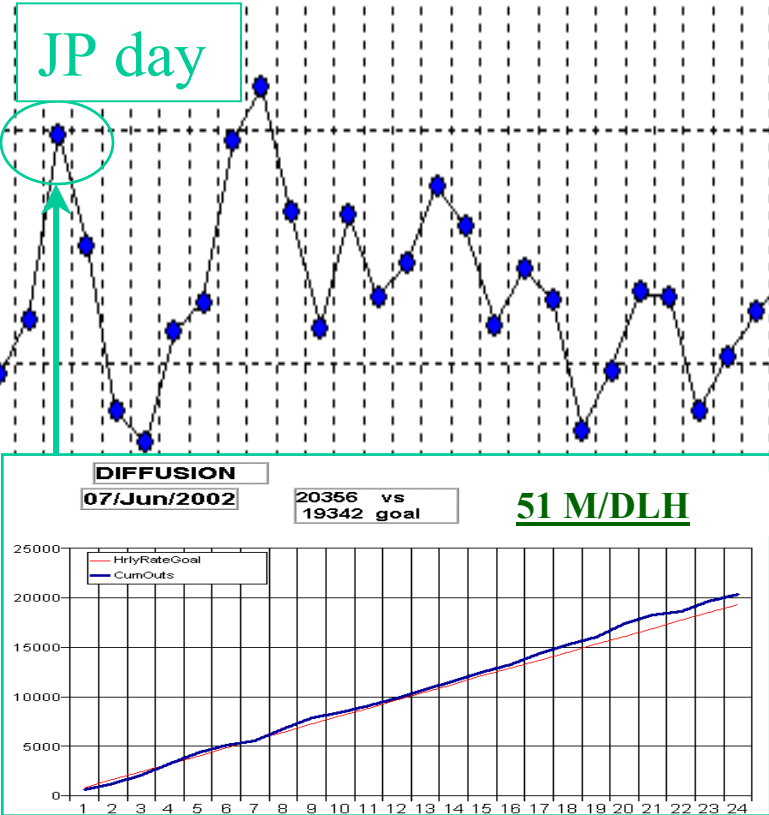
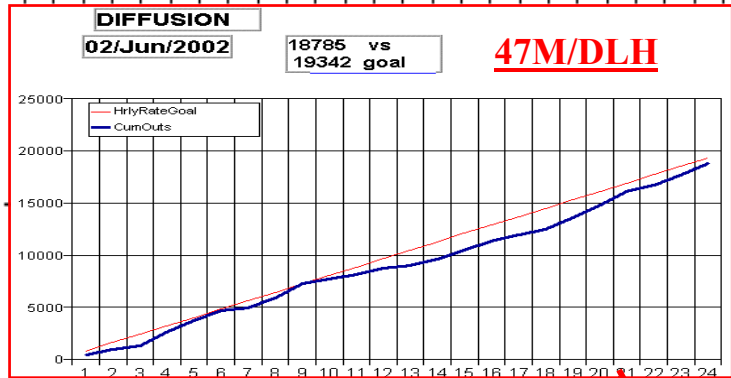
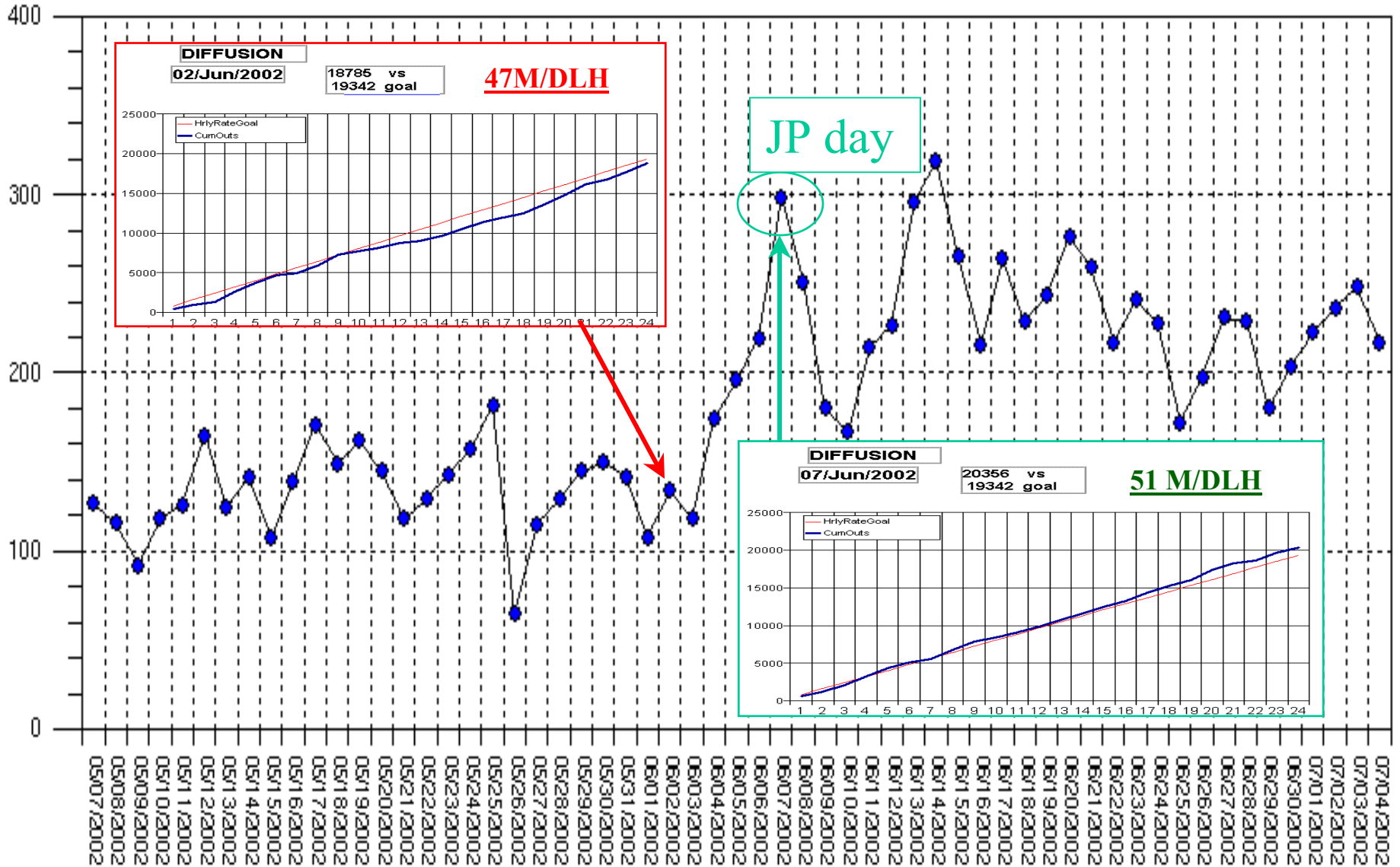
Entity Status (Running, Planned)

Furnace Unload Schedule

# Some Planning Requirements

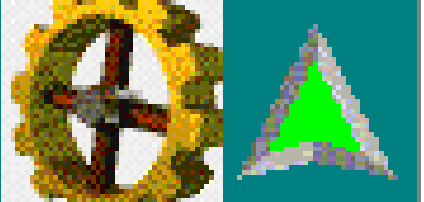
What	Where	Issues	Bayview
Inventory Available	Diff Detail	Updated Hourly (cleaned?)	<input checked="" type="checkbox"/>
Determine Qualified Tools	PC1164	Revision Control	<input checked="" type="checkbox"/>
Tools with Stop Notices	PC1164	EECN current?	<input checked="" type="checkbox"/>
Specific Tool Availability	ENHE	Up/Down, Ownership	<input checked="" type="checkbox"/>
Tool Completion Time	ENHE	Associate Entered	<input checked="" type="checkbox"/>
Pending Quals for Tool	VSEN	Slipped schedules	<input checked="" type="checkbox"/>
Tool issues / alarms	ENHL	Download Blocked	<input checked="" type="checkbox"/>
Inventory Priority	DLIS	Multiple DLIS	<input checked="" type="checkbox"/>
Maximum Load Size	PC1164	Varies by Tool	<input checked="" type="checkbox"/>
Recipe Duration	PC1164	Accuracy?	<input checked="" type="checkbox"/>
Quantity Running	DLIS	ACTV/QUEUE Mixed PF's	<input checked="" type="checkbox"/>
Competing Plans	Lead Sheet	Verbal and Memory	<input checked="" type="checkbox"/>

# “Diff Plans” by Day 5/7/02 to 7/4/02

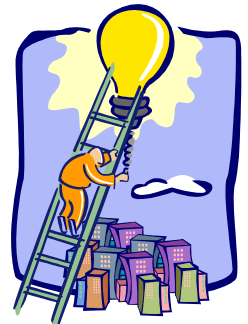


**New!**

# Automatic DLIS plan 2 hrs prior

 PF1239 B-DM09S	<b>N DRIVE</b> <b>J2</b>
	13:12 JUN 26, 14:38 <b>06250645.JGA</b>
Qty In: 108	Next Rank: 1 by dlis
72 of 383	Next Plan: PF1239

- Does not alter existing plans, provides plan when empty
- Can be changed by associate/lead etc...
- Requires “lock in” by associate logging Diff Plan !
- Will update automatically every 2 minutes until “locked in”





# History Button Output Example Furn D4

Microsoft Excel - iss\_furnace\_report.xls

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U \$ % , +.00 +.00

	A	B	C	D	E
1	Furnace	Event	When	Who	Comments
2	FURN D4	DIFF INFO	4/11/02 16:49	CDXTTE	
3	FURN D4	PF1200 LOAD	4/11/02 16:46	CDXTTE	
4	FURN D4	DIFF PLAN	4/11/02 15:30	CGQTTE	
5	FURN D4	PF1196 SPC	4/11/02 14:55	CDXTTE	
6	FURN D4	JGASPCZERO	4/11/02 14:47	WTS-AUTOLOG	There were zero alerts reported.
7	FURN D4	DIFF INFO	4/11/02 8:09	CBEJTE	
8	FURN D4	PF1196 LOAD	4/11/02 8:06	CBEJTE	
9	FURN D4	DIFF PLAN	4/11/02 7:23	CBEJTE	
10	FURN D4	PF1188 SPC	4/11/02 7:21	CBEJTE	
11	FURN D4	JGASPCZERO	4/11/02 7:06	WTS-AUTOLOG	There were zero alerts reported.
12	FURN D4	DIFF INFO	4/11/02 0:26	CBEJTE	
13	FURN D4	PF1188 LOAD	4/11/02 0:23	CBEJTE	
14	FURN D4	PF1200 SPC	4/11/02 0:22	CBEJTE	
15	FURN D4	JGASPCZERO	4/11/02 0:19	WTS-AUTOLOG	There were zero alerts reported.
16	FURN D4	DIFF PLAN	4/10/02 22:25	TCDHTE	
17	FURN D4	DIFF INFO	4/10/02 20:39	CDXTTE	
18	FURN D4	PF1200 LOAD	4/10/02 20:37	CDXTTE	
19	FURN D4	PF1200 SPC	4/10/02 20:36	CDXTTE	
20	FURN D4	JGASPCZERO	4/10/02 20:30	WTS-AUTOLOG	There were zero alerts reported.



# Diffusion Inventory Viewer (All Diffusion)

11:18:13 CDT 2002

Focus	RUNNING	TO_RUN	script_id	HR_MM	BEGINNING	PreCleaning	LOADABLE	Furnaces_planned
Al Drive	36	0	PF1195	06:21				
Al Drive	67	0	PF1243	24:47				
Al Drive		24	PF1254	05:05	24			
Al Drive	54	0	PF1276	20:45				
Al Drive		12	PF1280	05:21	12			
Anneal		84	PF1187	02:15	84			
Anneal	21	0	PF1214	02:45				
Anneal	23	0	PF1524	02:30				
Anneal	44	0	PF1528	02:15				
Anneal		12	PF1544	01:45	12			
Anneal	24	6	PF2046	01:45	6			
BBr3	132	72	PF1305	06:08	48	24		
BBr3	72	24	PF1314	05:35		24		
BBr3		24	PF1316	05:42		24		
Clean Ox		36	PF1029	04:23	36			
Clean Ox		21	PF1073	06:48			21	
Clean Ox		147	PF1165	05:13		72	75	
Clean Ox	48	0	PF1176	03:58				
Clean Ox	240	359	PF1188	06:41	24	312	23	D4,
Clean Ox	24	10	PF1193	03:42	10			
Clean Ox		84	PF1196	06:38	24	12	48	
Clean Ox	48	189	PF1198	03:41	48	94	47	
Clean Ox	24	96	PF1200	03:40	24		72	
Clean Ox		71	PF1203/1340	03:02	71			
Clean Ox	24	0	PF1234	03:38				
Clean Ox	24	0	PF1242	05:50				





# Furnace Unload Plan (subtotals by hour)

1	2	3	A	B	C	D	E
			HR_COMP1	Completion_ Time	entity	load_ size	Process_ Flow
	1						
+	12		06/13/2002 11 Total			890	
+	24		06/13/2002 12 Total			674	
·	25		06/13/2002 13	6/13/02 13:02	FURN G3	60	PF1552
·	26		06/13/2002 13	6/13/02 13:19	FURN I1	66	PF1175
·	27		06/13/2002 13	6/13/02 13:23	FURN I2	24	PF1420
·	28		06/13/2002 13	6/13/02 13:24	FURN K4	22	PF1222
·	29		06/13/2002 13	6/13/02 13:27	FURN E2	95	PF1035
·	30		06/13/2002 13	6/13/02 13:39	FURN F4	24	PF1324
·	31		06/13/2002 13	6/13/02 13:43	FURN D2	48	PF1515
·	32		06/13/2002 13	6/13/02 13:50	FURN V2	24	PF1195
·	33		06/13/2002 13	6/13/02 13:55	FURN G4	24	PF1132
·	34		06/13/2002 13	6/13/02 13:56	FURN G1	60	PF1068
-	35		06/13/2002 13 Total			447	
+	47		06/13/2002 14 Total			651	
+	55		06/13/2002 15 Total			432	
+	60		06/13/2002 16 Total			382	
+	63		06/13/2002 17 Total			169	
+	66		06/13/2002 18 Total			144	
+	68		06/13/2002 19 Total			48	
+	74		06/13/2002 20 Total			476	
+	76		06/13/2002 22 Total			48	
+	78		06/14/2002 07 Total			144	
·	79						
·	80		Grand Total			4505	

# Diffusion Pre-Clean Planning List

wetdeck	wd_recipe	Completion_Time	entity	DIFF_PLAN	lot_number	quantity_1	step	PRIORITY_CLASS	CLEANED	BATCH_SPACE
2WD 11, BLD 21,	ARMADIL	07/08/2002 15:52:01	FURN E1	PF1191	X003063Z	24		20.5 hrs BEHIND	48	52
2WD 9,	SC2	07/08/2002 14:13:14	FURN G1	PF1517	E00303FG	24		SPECIAL_PRIORITY	48	102
2WD 9,	SC2	07/08/2002 14:13:14	FURN G1	PF1517	E00303PB	6		SPECIAL_PRIORITY	48	102
2WD 9,	SC2	07/08/2002 14:13:14	FURN G1	PF1517	E00302HJ	12		13.7 hrs LATE	48	102
2WD 9,	SC2	07/08/2002 14:13:14	FURN G1	PF1517	E00302DG	12		17 days BEHIND	48	102
2WD 9,	SC2	07/08/2002 14:13:14	FURN G1	PF1517	E00303JH	24		15 days BEHIND	48	102
2WD 9,	SC2	07/08/2002 14:13:14	FURN G1	PF1517	E003042A	12		8.8 days BEHIND	48	102
2WD 9,	SC1+SC2	07/08/2002 15:04:45	FURN U1	PF1407	EC0251KD	10		11 days LATE	20	130
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN J3	PF1506	E003064D	24	190	1.2 days BEHIND		200
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN J3	PF1506	E003064C	24	190	1.2 days BEHIND		200
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN J3	PF1506	E00306DD	24	190	1.2 days BEHIND		200
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN J3	PF1506	E003065M	24	190	1.0 day BEHIND		200
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN J3	PF1506	E003065A	24	190	1.0 day BEHIND		200
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN J3	PF1506	E003065N	24	190	1.0 day BEHIND		200
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN M4	PF1029	XC03067M	24	185	10.9 hrs BEHIND	96	54
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN M4	PF1029	X003067N	24		10.9 hrs BEHIND	96	54
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN S1	PF1508	E003053S	24	185	3.3 days BEHIND		150
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN S1	PF1508	E003054Z	24	185	1.7 days BEHIND		150
SMSRM 05, SMSRM 06,	PREDIFFCLN	07/08/2002 13:40:45	FURN S1	PF1508	E003055G	24	185	1.3 days BEHIND		150
WETDECK 19C,	PRE-GATE	07/08/2002 13:40:45	FURN C1	PF1091	X00305FD	24		HOT		150
WETDECK 19C,	PRE-GATE	07/08/2002 13:40:45	FURN C1	PF1091	XC03064H	24		0.7 hrs AHEAD		150
WETDECK 19C,	PRE-GATE	07/08/2002 16:10:22	FURN G2	PF1091	X00305FD	24		HOT		150
WETDECK 19C,	PRE-GATE	07/08/2002 16:10:22	FURN G2	PF1091	XC03064H	24		0.7 hrs AHEAD		150

# Diffusion Productivity



# What the folks are saying about Bayview...

- 90% of diffusion's productivity improvements due to applications of these tools. Gary E.
- Saves me 3 hours a night.. Shawn C.
- Makes my worst lead as effective as my best lead. John P.
- Saves me an hour a day for passdown at least. Vicki H.
- Worth its weight in GOLD, it's Awesome Ted L.
- Without it feels like running blind.. John P.
- Operators tell me to "just put it in Diff Plan" instead of trying to remember plans. Dao I.
- I LOVE IT. Terri G.
- My Operators use it, and it helps me check up on them. Annie P.
- This is GREAT. Nate F.
- Helps me communicate to my Operators.. Giang T.
- Don't you EVEN THINK about taking it away. Sherry H.