Software Scope for Cell Production Monitoring System.

V 1.1.1

Modified Date: Apr 06 2012

History

V 1.1 Modified Date: Feb 25 2012
V 1.0 Modified Date: Dec 02 2011

Software Scope for Cell Production Monitoring System

Introduction:

The system would allow monitoring for various production cells in a plant in realtime with the ability to locate cell stoppage. When stoppages are identified they can be qualified and appropriate reasons assigned to them. The system can also display the Plan Actual Gap and efficiency for each cell.

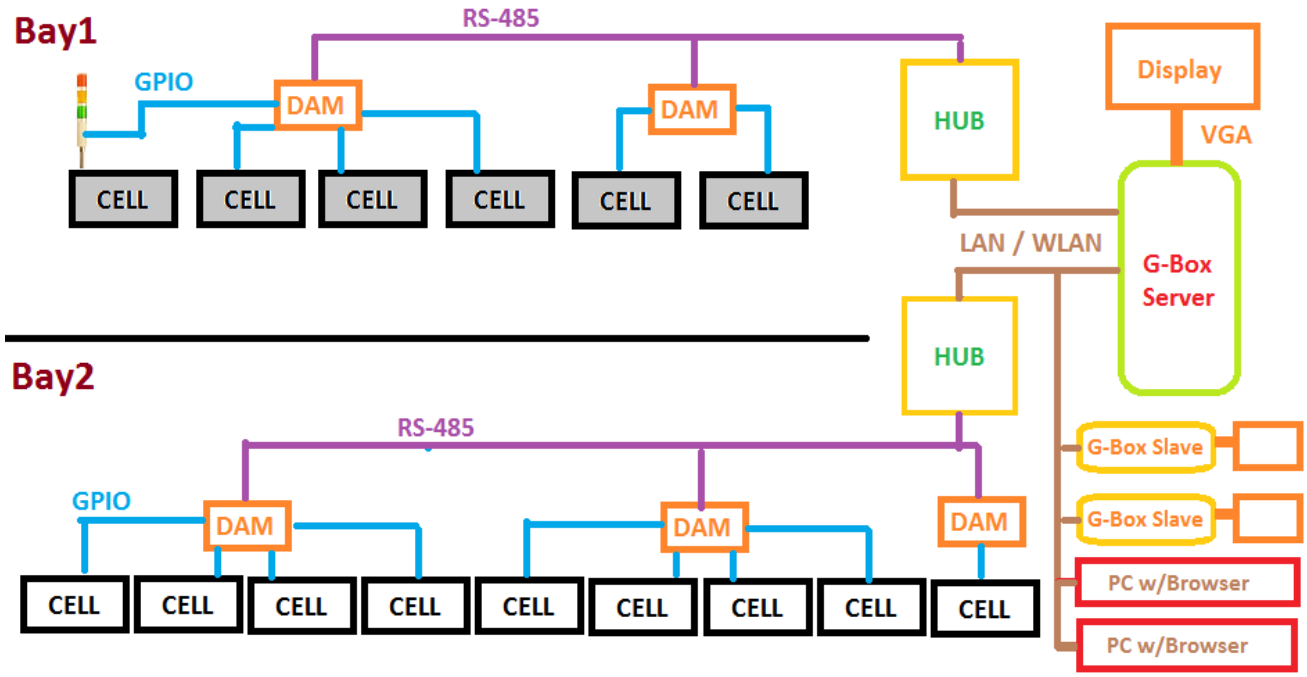
System Components.

The hardware modules in this system are

1) 48 Port Data Acquisition Module (DAM).
    - This is a hardware unit with 48 Potential Free Opto-Isolated inputs and RS485 output.
    - Two I/O Pins from the DAM are used for each cell.
    - The First pin is used to measure Actual.
    - The Second Pin is connected to Red light in the andon and is used to indicate Line Stoppage.

2) The DAM Modules would be connected a Hub Unit which would convert the RS-485 Signals to wired ethernet or WIFI to extend the range.
3) The HUBs would communicate to a central server uploading all the events in realtime.
4) The Server would contain a database that records all the events from all the DAQs.

Block Diagram



The Software modules in this system are

The Server would have a Cell Production System Software on it.

The Software system would have the following Master Modules.

BayLineMaster

CellMaster

PartMaster

Operator/Employee Master

ShiftTimeMaster

BreakTimeMaster

ReasonMaster

Reason Type Master (This holds the TPM Reasons.)

Provision to enter the TPM 16 losses

Operation.

Master Setup Phase

The Bays are defined and named .

The Cells are Defined and Named and mapped to bays.

Parts are defined with PartNo, PartName, Cycle times etc.

Operators are defined and named.

Daily Setup.

During this operations the supervisors responsible for cells/bays define

The Parts that are to be manufactured in the various cells along with the

Plan count for each cell. The cycle time is looked up from the part master.

Operation.

The system would monitor the Input lines from various cells and infer if an

Item was produced by looking at the Green Andon light duration

(if it matches the cycle time = 1 Actual) .

Similarly cell is down is infered from the Red Andon light.

The Display Screens

The display would have the following Screens.

Cell Status

Here the Cell Name, PartNo, Plan, Actual Gap and efficiency for one cell would be displayed.

When a cell is down an Alert message would be displayed on the screen the supervisor can log into the system and associate a appropriate reason from the Reason Master for the line being down along with typed Remarks.

Part no. & Part Description
Date , Time and shift (real time to be displayed)
Hourly output display Plan Vs Actual

Bay Status

Here the Bay Name, Cell Names PartNo, Plan, Actual Gap and efficiency for one all the cells associated with the bay would be displayed.

When a cell is down an Alert message / Reason would be displayed on the screen with red color.

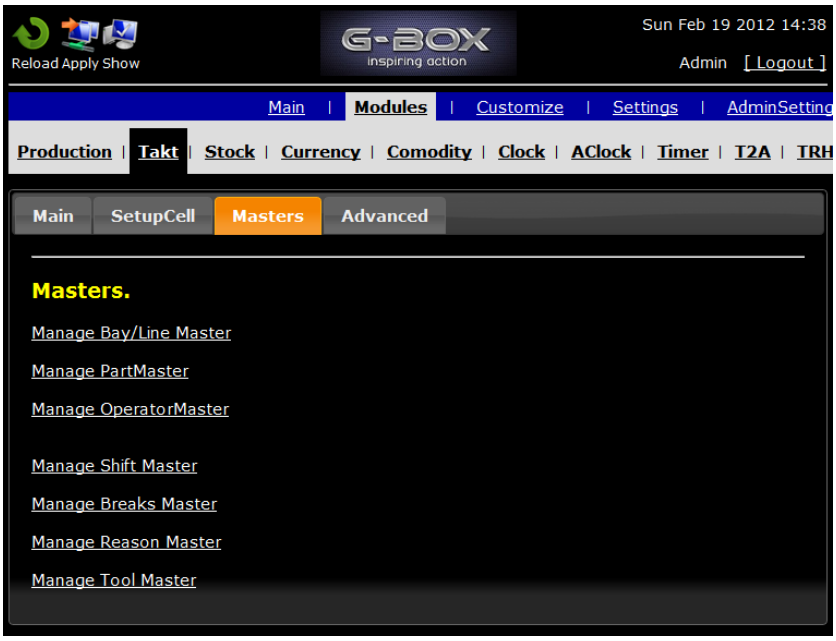
Reports.

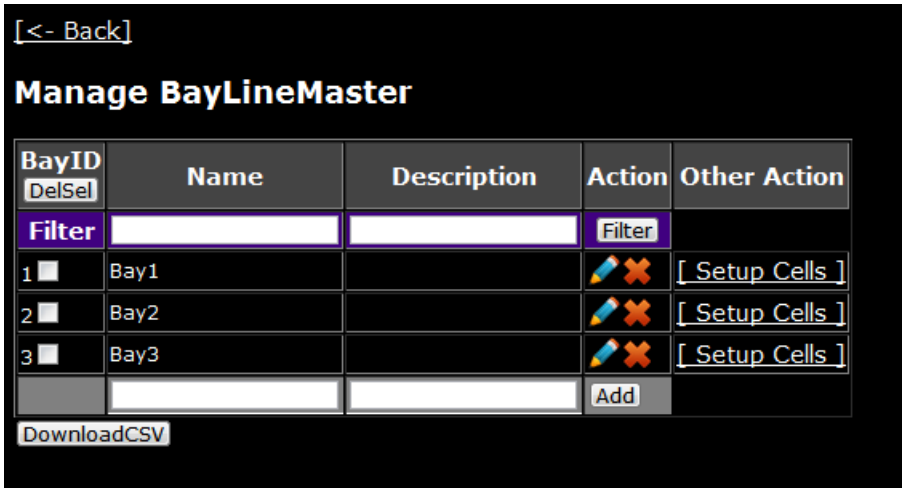
Here the supervisors can download all the events that happened during a Shift/Day as Excel compatible CSV File.

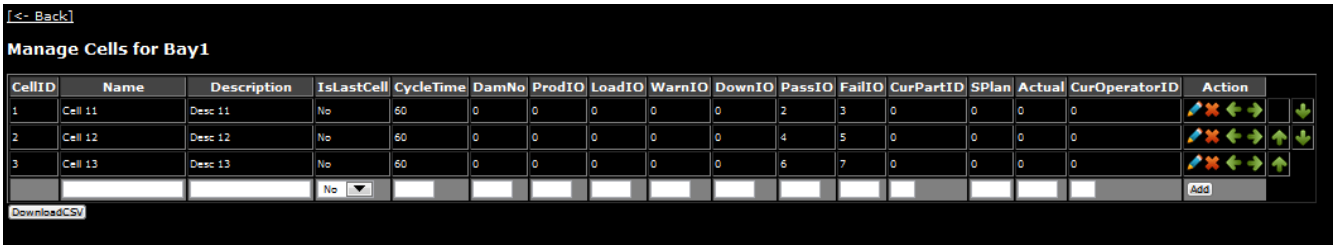
All the screens can be viewed from any PC with a LAN access to the GBox Server.

Screen Shots.

The following are the screen shots of the existing system and any changes to this is not part of the current scope. Request for changes would be taken as Custom Software development exercise.







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Manage PartMaster

PartID DelSel	PartNo	Name	Description	CycleTime	OtherData	Action
Filter						Filter
1	PartNo1	PartName1		60		
2	PartNo2	PartName2		60		
3	PartNo3	PartName3		60		
						Add

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Manage OperatorMaster

OperatorID DelSel	Name	Picture	Description	OtherData	Action
Filter					Filter
1	Operator 1				
2	Operator 2				
3	Operator 3				
					Add

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Manage ShiftMaster

ShiftNo DelSel	StartTime	EndTime	Action	Other Action
Filter			Filter	
1	06:00	14:00		[Hours]
2	14:00	22:00		[Hours]
3	22:00	06:00		[Hours]
			Add	

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Manage ShiftBreaks

ID DelSel	CellID	StartTime	EndTime	Action
Filter	ALL			Filter
1	AllCells	09:00	09:15	
2	AllCells	11:00	11:10	
3	AllCells	16:00	16:10	
	AllCells			Add

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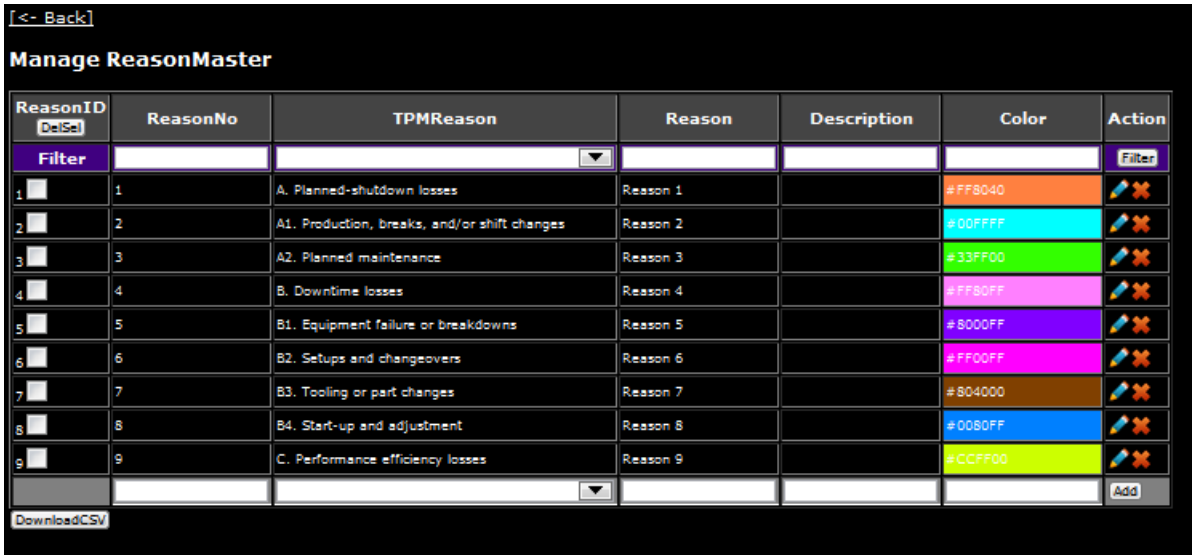
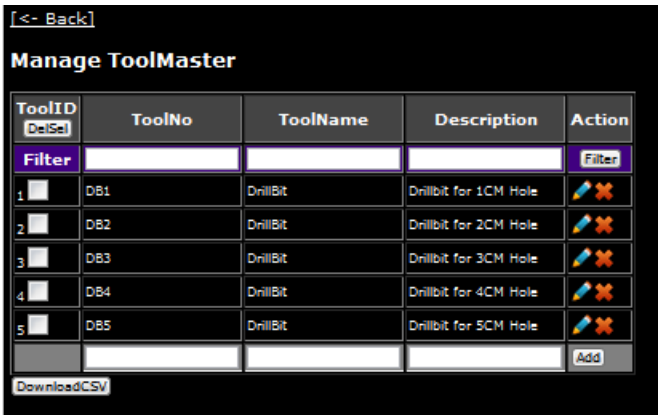
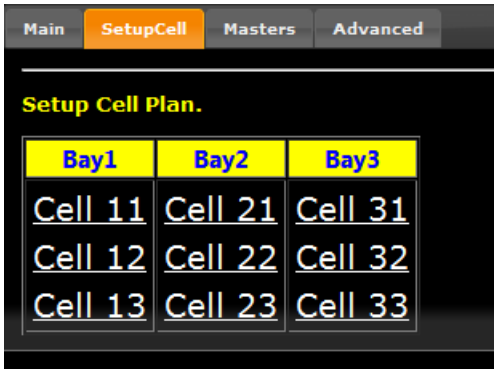
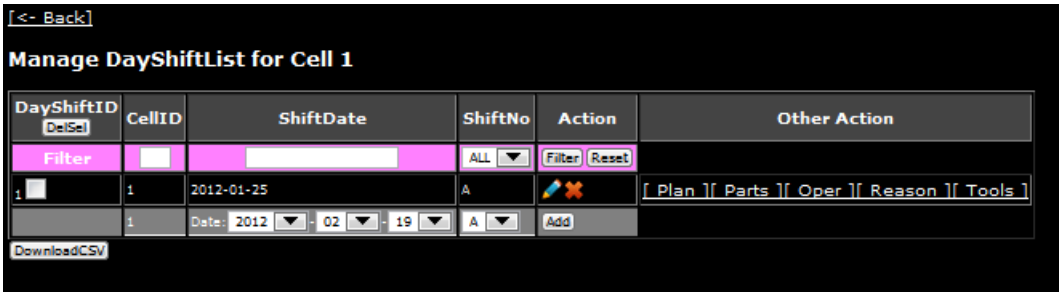


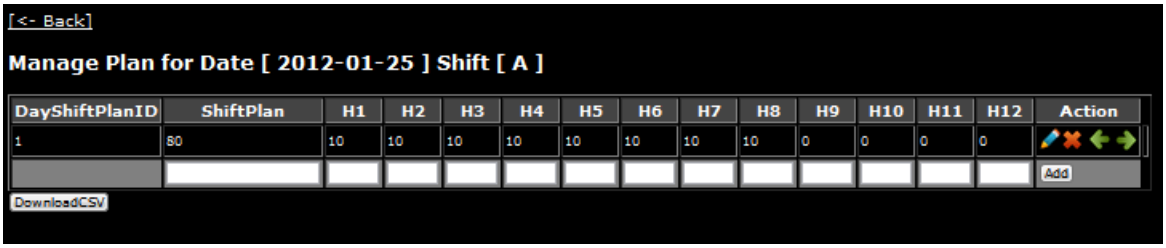


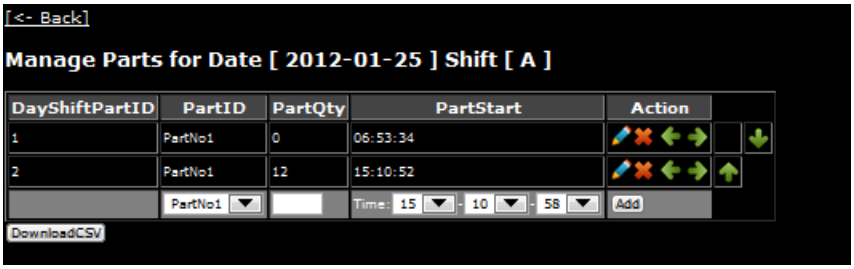
Once the Masters are setup the users with necessary previlages can setup the information for each shift.



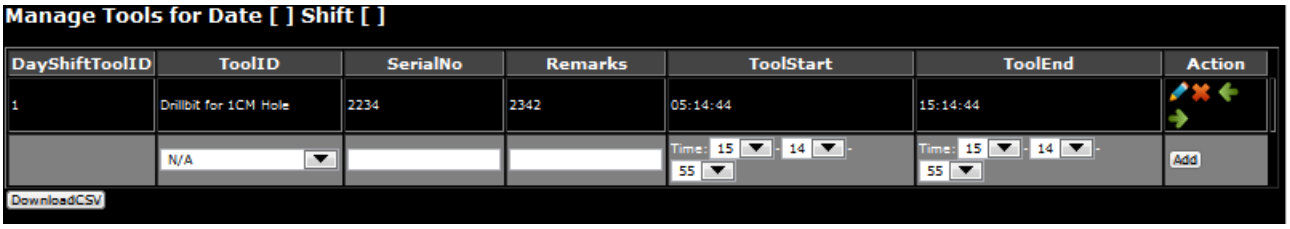
After selecting the cell the shift should be added and necessary setups like Parts, operators done.



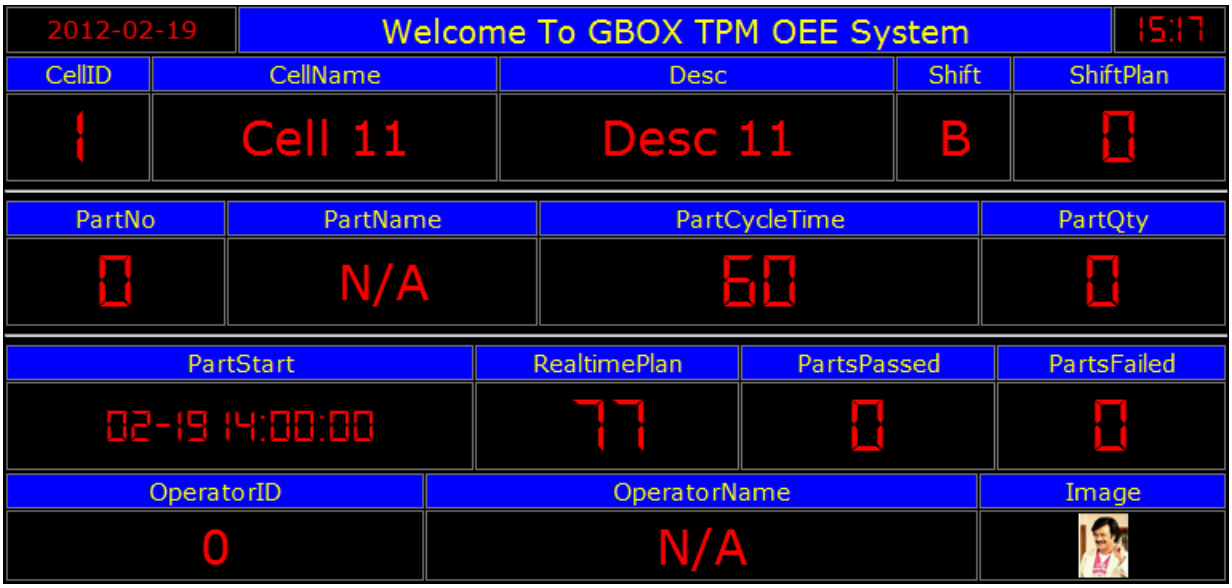




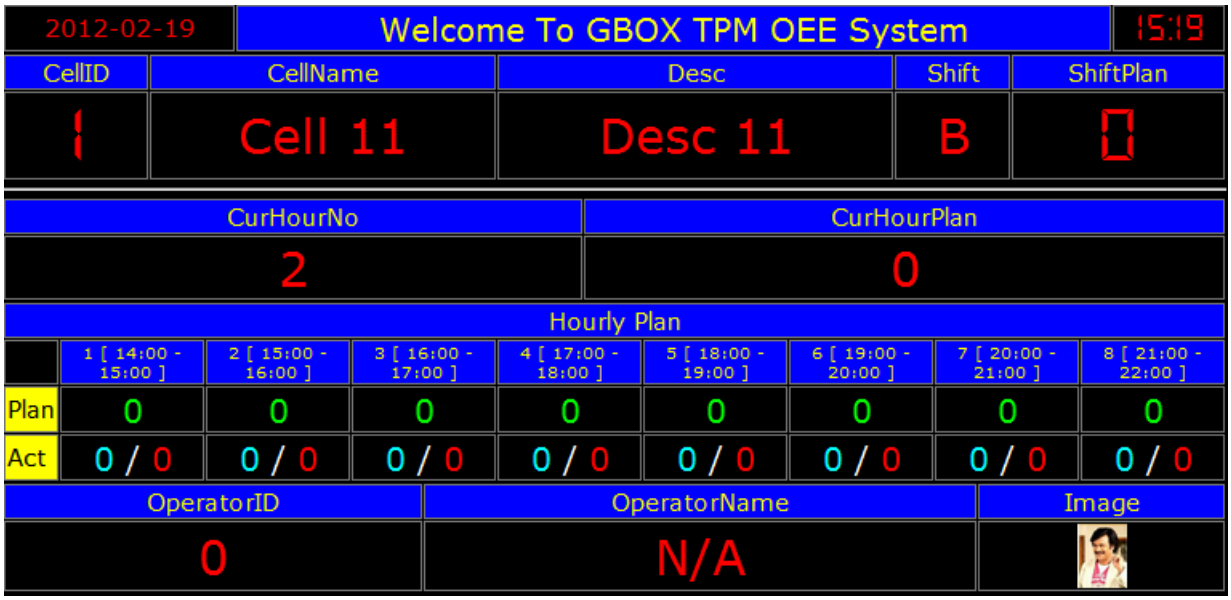
Here the supervisors can enter the reasons why , when and for how long the line was down.



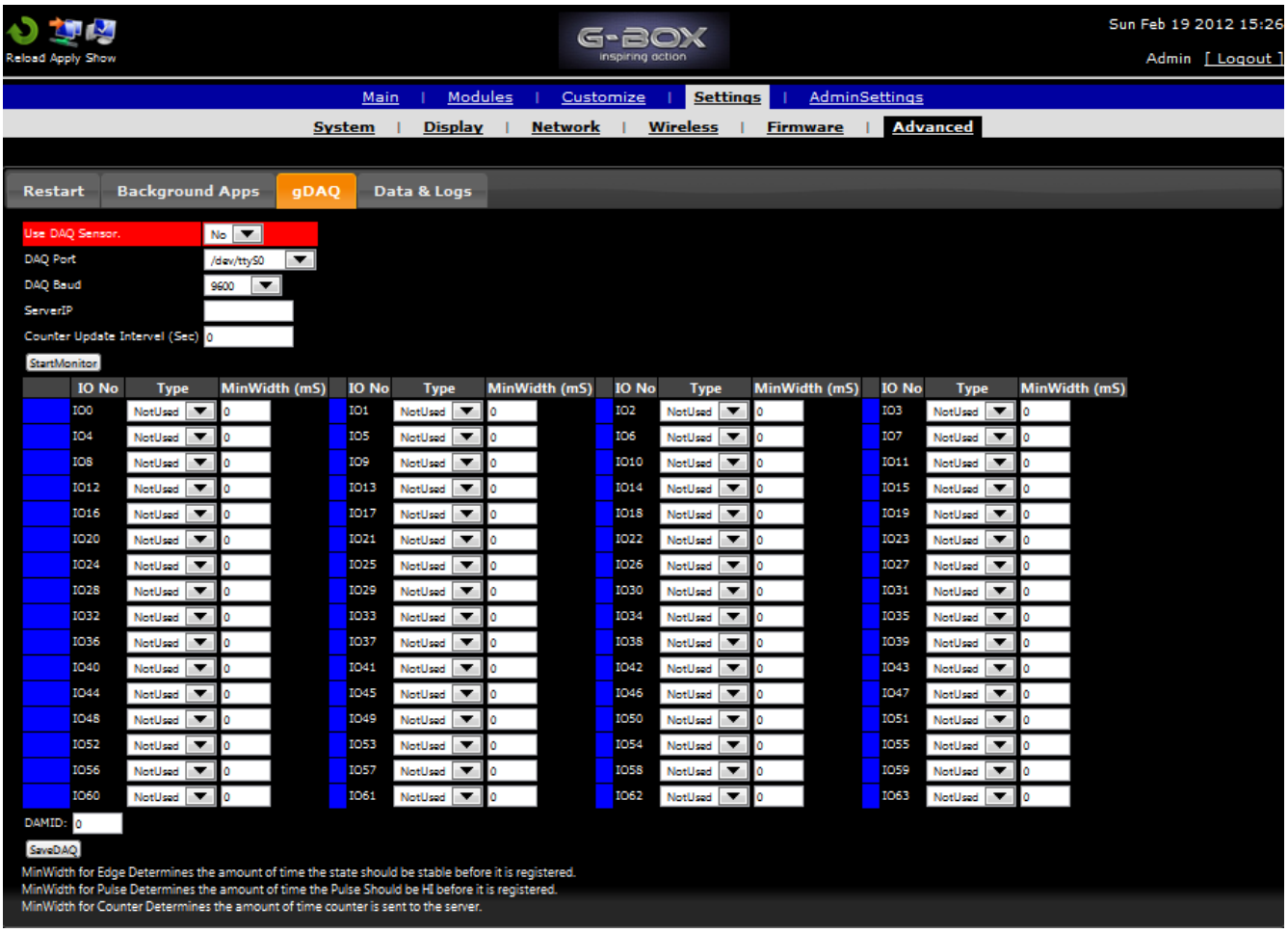
This would be the Display screen that displays the data for the **Shift**.



This would be the Display screen that displays the data for the **Hour**.



Software Setup for DAM. Assiging IO from the DAM to a CELL.



Here the IO Types are mapped.

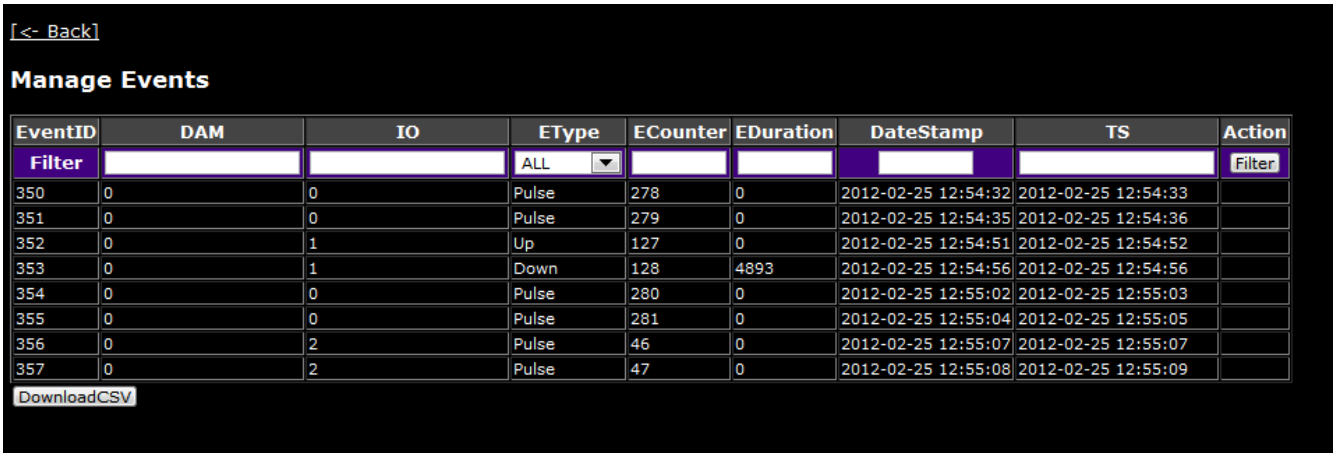
Pulse type IO lines count a Low->High-> Low transition and report them as event.

Edge type IO lines report a Low → High as a Up Event and
High → Low transition as a Down Event
with Duration for how long the line was high.

Inverted Edge type IO lines report a High → Low as a Up Event and
Low → High transition as a Down Event
with Duration for how long the line was low.

Counters are used to register fast pulse events where the count is more important than the actual event time stamp. Here the pulses are counted at the DAM and reported every 10 Seconds (Configurable) to the server.

In this screen we can see the raw events.



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Manage Events

EventID	DAM	IO	EType	ECounter	EDuration	DateStamp	TS	Action
Filter			ALL					Filter
350	0	0	Pulse	278	0	2012-02-25 12:54:32	2012-02-25 12:54:33	
351	0	0	Pulse	279	0	2012-02-25 12:54:35	2012-02-25 12:54:36	
352	0	1	Up	127	0	2012-02-25 12:54:51	2012-02-25 12:54:52	
353	0	1	Down	128	4893	2012-02-25 12:54:56	2012-02-25 12:54:56	
354	0	0	Pulse	280	0	2012-02-25 12:55:02	2012-02-25 12:55:03	
355	0	0	Pulse	281	0	2012-02-25 12:55:04	2012-02-25 12:55:05	
356	0	2	Pulse	46	0	2012-02-25 12:55:07	2012-02-25 12:55:07	
357	0	2	Pulse	47	0	2012-02-25 12:55:08	2012-02-25 12:55:09	

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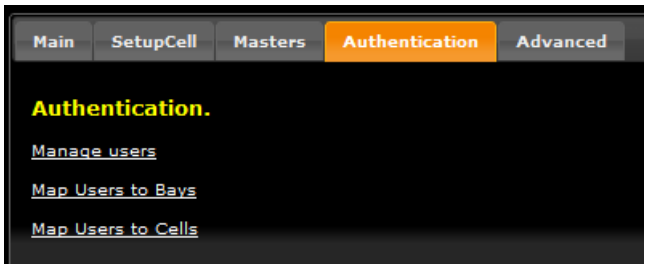
This is the ONLY reporting screen that comes by default, the data from this can be used to create detailed reports by joining the data with various Cell Master tables.

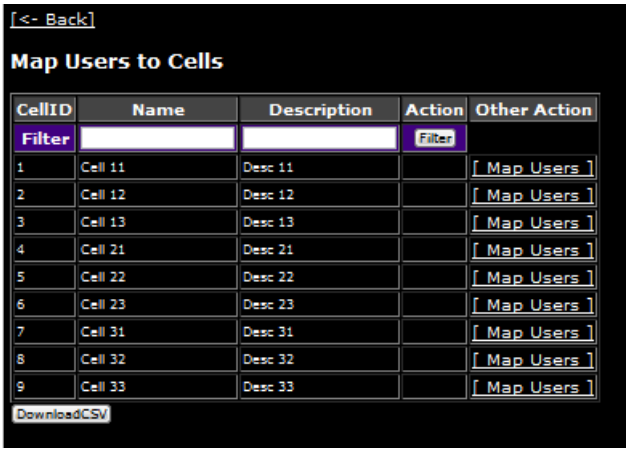
Here the DAM ID, IO ID , Event Type , Counter , Duration and Timestamp are registered. This is available for download as CSV. This table needs to be periodically purged after taking the backup.

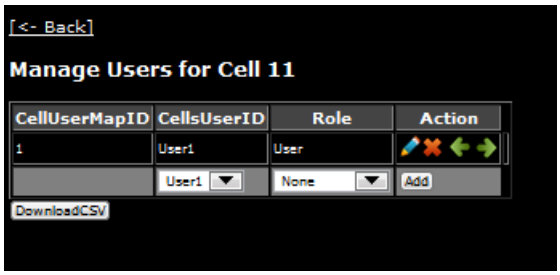
Additional Requirements.

Security Module.

This module would allow you to setup users and passwords for operators to login to the system. You can then map a User, Supervisor and Admin roles for each cell to a login user. User will be allowed readonly access. Supervisors are allowed to only Add entries. Admins can Edit and Delete entries.







Custom Reports

Hit ratio for first hour production (plan Vs Actual) in every shift –day wise

Hit ratio for first hour production (plan vs Actual) for every first day of Week

The following Requirements would be taken up as a Custom Exercise with a system implementer and is not a part of the current scope.

Plant Status Dashboard.

Here all the cell's information would be displayed. When a cell is down an Alert message / Reason would be displayed on the screen with red color along with the Cell Name and Bay Name.

Data Import Module Sample

Here we would provide the schema for the masters in the system along with the procedure to connect to the MYSQL database server from a .net app. **The actual software for importing data from the Backend and Inserting into the G-Box Master server is not part of this scope and should be implemented by your team.**