KPI's & Wireless Manual Data

Presented by **Bryan Pigg**

KPI's & Wireless Manual Data

How can the PI System be leveraged to not only collect data but use that data to improve the efficiency of plants on a real time basis.

CF Industries

Business Challenge

- Need to find process problems quickly
- Not collecting all data, electronically, that the plants generate

Solution

- Implement KPI's for plants and plant systems
- Utilize wireless readings and form based data entry to achieve 100% data collection.

Results and Benefits

- By identifying problems in the process quickly, efficiency can be held at a higher level, minimizing production loss

Introduction

- Introduction of the PI System to CF – Yazoo City
  - PI System was installed in 1995
    - Was configured to collect data from a Fisher Provox/Provue DCS system via a CHIP interface.
    - PI ProcessBook and PI DataLink was the only software utilized.
  - PI System Today
    - Collects data from DeltaV via PI Interface for OPC HDA
    - Collects data from SQL via PI Interface for RDMS
    - Provides data to SharePoint via PI WebParts & PI DataLink Server
    - Provides alerts via PI AF and PI Notifications
    - Provides data to StackVision (NOx Data Collector) via PI Interface for Modbus Ethernet
- Personal Experience
  - Inspection Data
    - All inspection data was written on paper, twice
    - If trending was desired a redundant data entry was entered into an Excel spreadsheet
  - Analytical Data
    - All analytical data was written on paper
    - Data was shared via phone calls

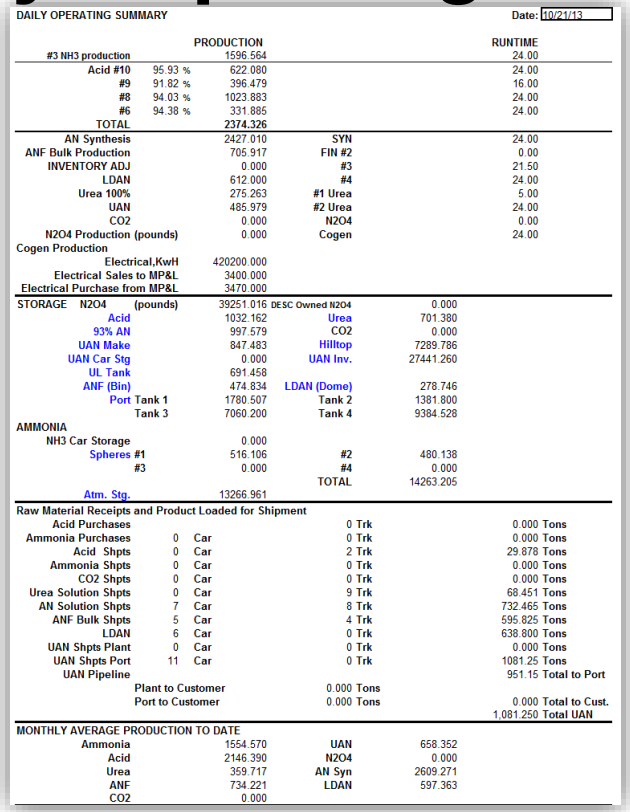
How is this data of any use if it only exists on paper?

Value of PI System @ CF – Yazoo City

- Daily Production & Inventory Reporting
- Control Raw Material Usage
- Form Based Data Collection
- KPI’s for Plant Health
- Wireless Manual Data

Daily Production & Inventory Reporting

- Viewed via SharePoint
- Excel spreadsheet with data provide by PI DataLink Server
- Inventories hyperlinked to PI Trend web parts
- Date is a parameter to allow viewing reports in the past



DAILY OPERATING SUMMARY — Date: 10/21/13

		PRODUCTION		RUNTIME
#3 NH3 production		1596.564		24.00
Acid #10	95.93 %	622.080		24.00
#9	91.82 %	396.479		16.00
#8	94.03 %	1023.883		24.00
#6	94.38 %	331.885		24.00
TOTAL		2374.326		
AN Synthesis		2427.010	SYN	24.00
ANF Bulk Production		705.917	FIN #2	0.00
INVENTORY ADJ		0.000	#3	21.50
LDAN		612.000	#4	24.00
Urea 100%		275.263	#1 Urea	5.00
UAN		485.979	#2 Urea	24.00
CO2		0.000	N2O4	0.00
N2O4 Production (pounds)		0.000	Cogen	24.00
Cogen Production				
Electrical,KwH		420200.000		
Electrical Sales to MP&L		3400.000		
Electrical Purchase from MP&L		3470.000		

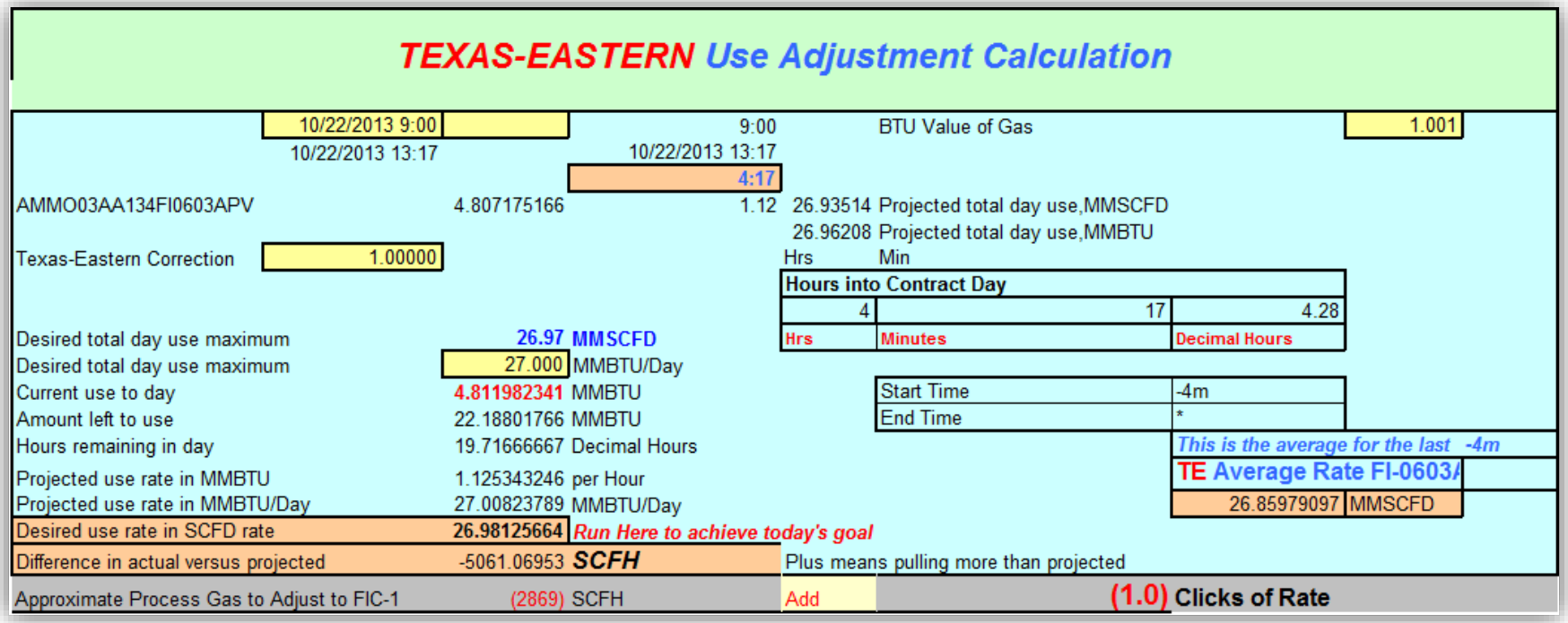
STORAGE N2O4 (pounds)		DESC Owned N2O4	
	39251.016		0.000
Acid	1032.162	Urea	701.380
93% AN	997.579	CO2	0.000
UAN Make	847.483	Hilltop	7289.786
UAN Car Stg	0.000	UAN Inv.	27441.260
UL Tank	691.458		
ANF (Bin)	474.834	LDAN (Dome)	278.746
Port Tank 1	1780.507	Tank 2	1381.800
Tank 3	7060.200	Tank 4	9384.528

AMMONIA			
NH3 Car Storage	0.000		
Spheres #1	516.106	#2	480.138
#3	0.000	#4	0.000
		TOTAL	14263.205
Atm. Stg.	13266.961		

Raw Material Receipts and Product Loaded for Shipment						
Acid Purchases			0	Trk	0.000	Tons
Ammonia Purchases	0	Car	0	Trk	0.000	Tons
Acid Shpts	0	Car	2	Trk	29.878	Tons
Ammonia Shpts	0	Car	0	Trk	0.000	Tons
CO2 Shpts	0	Car	0	Trk	0.000	Tons
Urea Solution Shpts	0	Car	9	Trk	68.451	Tons
AN Solution Shpts	7	Car	8	Trk	732.465	Tons
ANF Bulk Shpts	5	Car	4	Trk	595.825	Tons
LDAN	6	Car	0	Trk	638.800	Tons
UAN Shpts Plant	0	Car	0	Trk	0.000	Tons
UAN Shpts Port	11	Car	0	Trk	1081.25	Tons
UAN Pipeline					951.15	Total to Port
Plant to Customer			0.000	Tons		
Port to Customer			0.000	Tons	0.000	Total to Cust.
					1,081.250	Total UAN

MONTHLY AVERAGE PRODUCTION TO DATE			
Ammonia	1554.570	UAN	658.352
Acid	2146.390	N2O4	0.000
Urea	359.717	AN Syn	2609.271
ANF	734.221	LDAN	597.363
CO2	0.000		

Control Raw Material Usage



TEXAS-EASTERN Use Adjustment Calculation

	10/22/2013 9:00		9:00	BTU Value of Gas	1.001
	10/22/2013 13:17		10/22/2013 13:17		
			4:17		
AMMO03AA134FI0603APV		4.807175166	1.12	26.93514	Projected total day use,MMSCFD
				26.96208	Projected total day use,MMBTU
Texas-Eastern Correction	1.00000			Hrs	Min
				Hours into Contract Day	
				4	17
				Hrs	Minutes
Desired total day use maximum		26.97	MMSCFD		
Desired total day use maximum		27.000	MMBTU/Day		
Current use to day		4.811982341	MMBTU		
Amount left to use		22.18801766	MMBTU		
Hours remaining in day		19.71666667	Decimal Hours		
Projected use rate in MMBTU		1.125343246	per Hour		
Projected use rate in MMBTU/Day		27.00823789	MMBTU/Day		
Desired use rate in SCFD rate		26.98125664	*Run Here to achieve today's goal*		
Difference in actual versus projected		-5061.06953	***SCFH***	Plus means pulling more than projected	
Approximate Process Gas to Adjust to FIC-1		(2869)	SCFH	Add	**(1.0) Clicks of Rate**

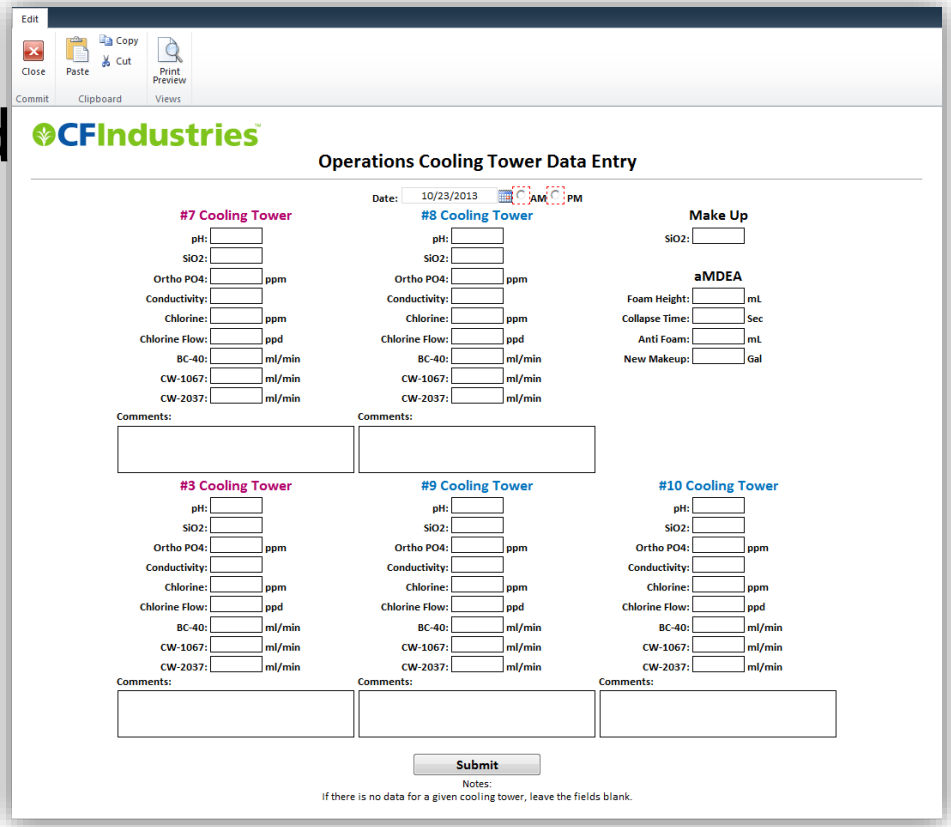
Start Time	-4m
End Time	*

This is the average for the last -4m

TE Average Rate FI-0603A	
26.85979097	MMSCFD

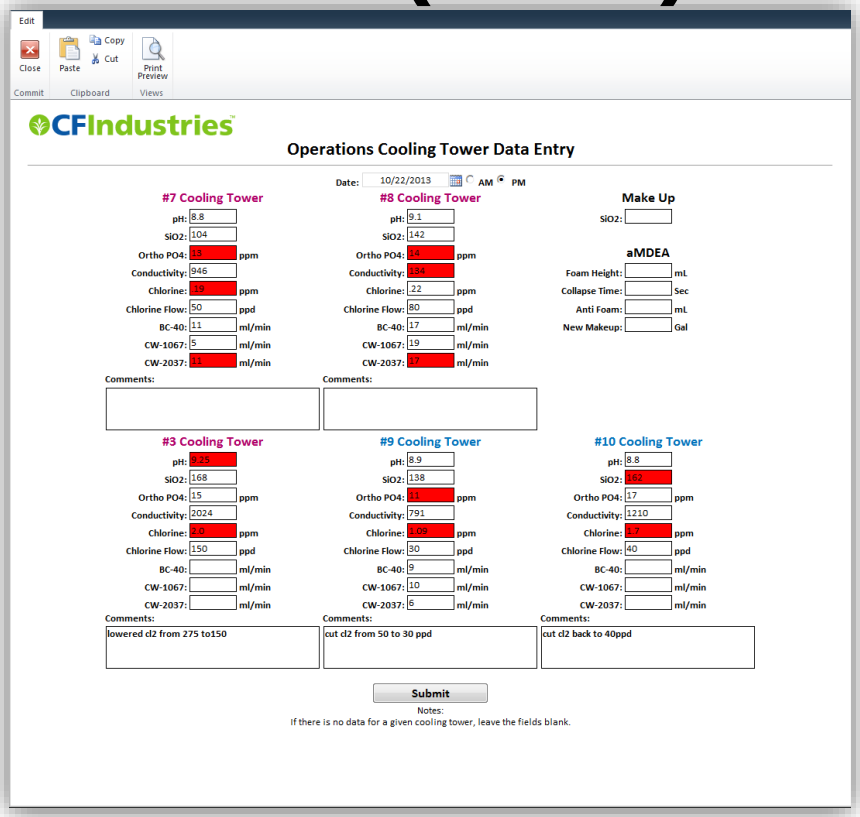
Form Based Data Collection

- InfoPath form published to SharePoint
- Utilizing custom web services and PI SDK to send data to PI Server



Form Based Data Collection (cont.)

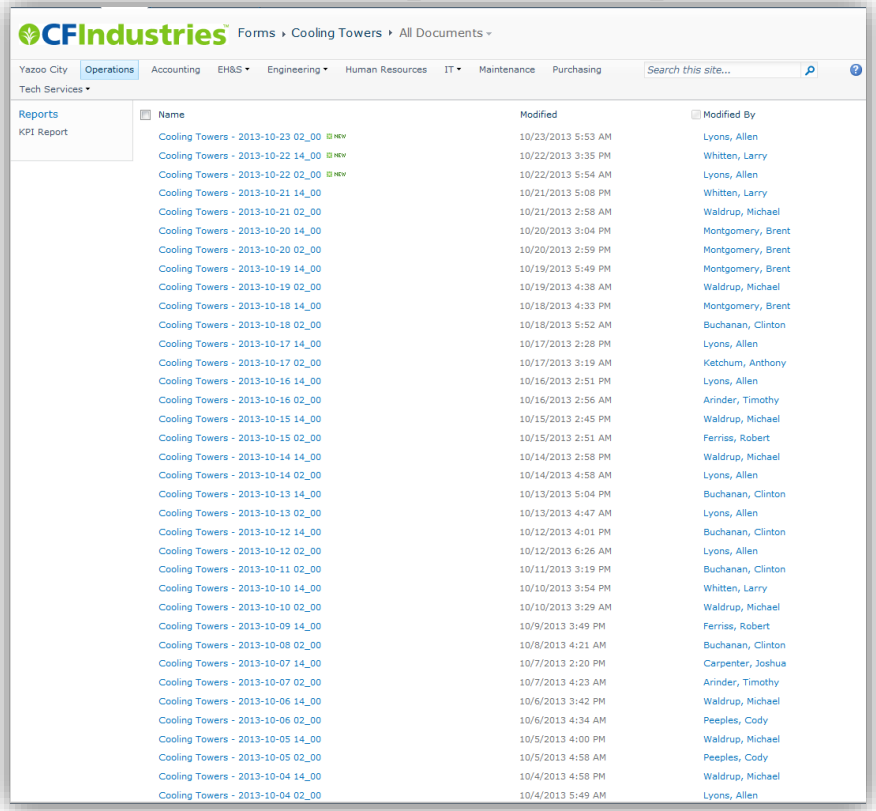
- Data Validation
- Hyperlinking



Form Based Data Collection (cont.)

Form Based Data Collection (cont.)

- Data entry events are represented by a saved form in the library
- All data can edited for an event

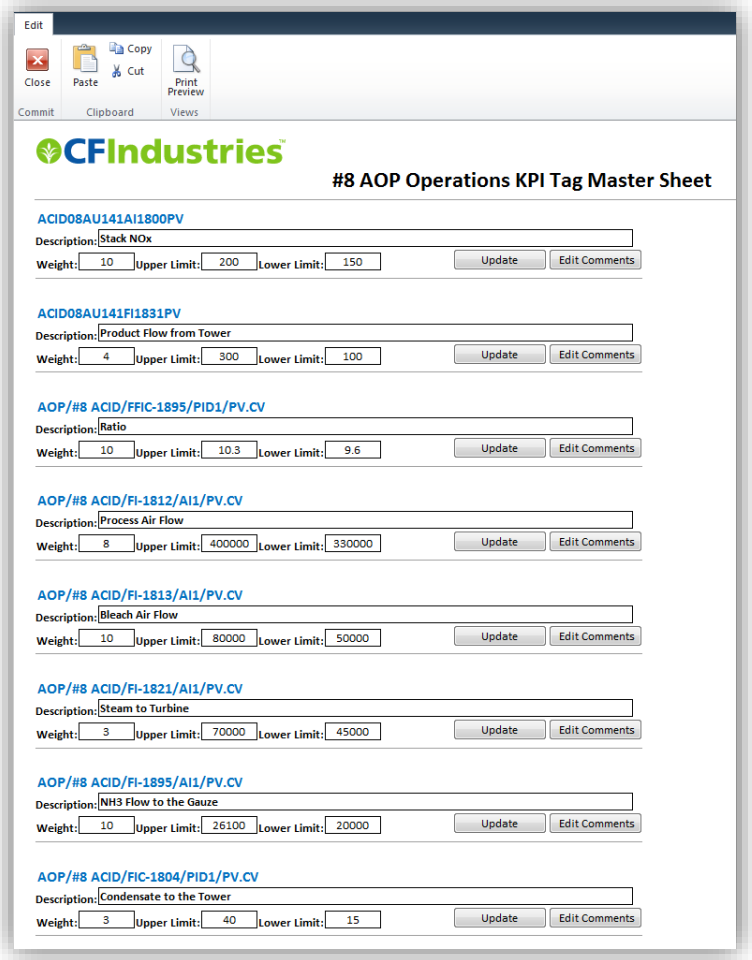


Plant KPI’s

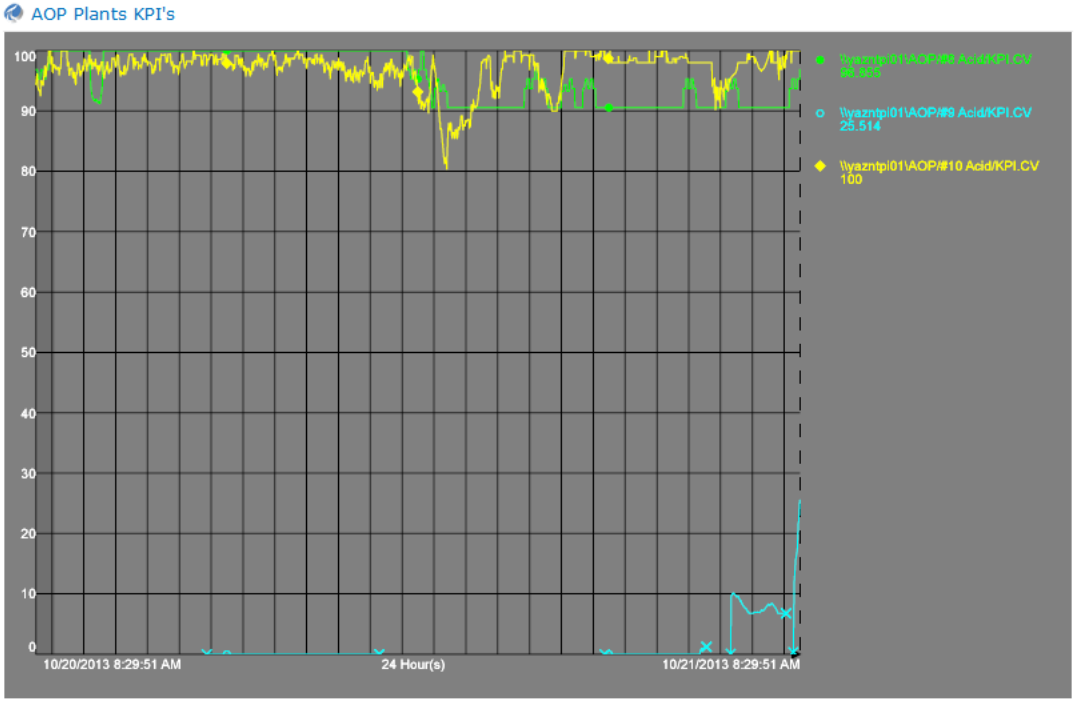
- DCS Data
- Form Based Data
- Wireless Manual Data
- PI ACE
- SQL Server
- Administered via SharePoint

Plant KPI's (cont.)

- InfoPath form created for each KPI
- KPI parameters are editable and KPI calculation reflects changes instantly

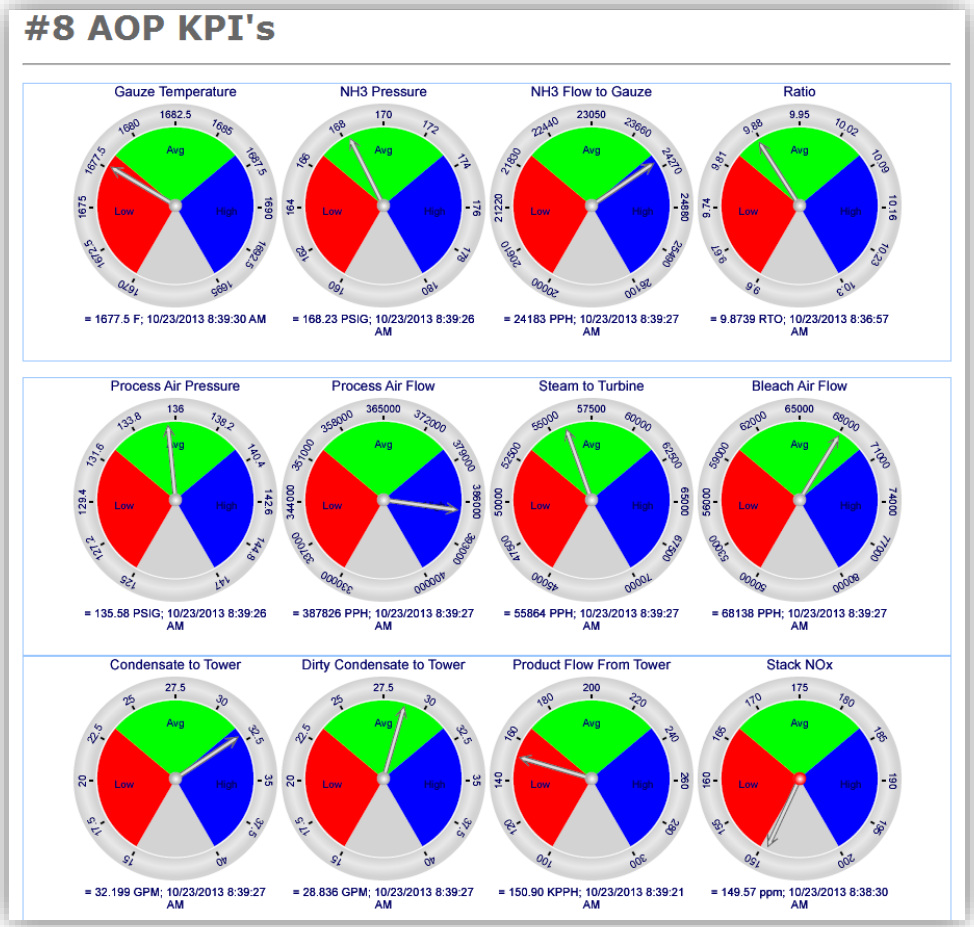


Plant KPI's (cont.)



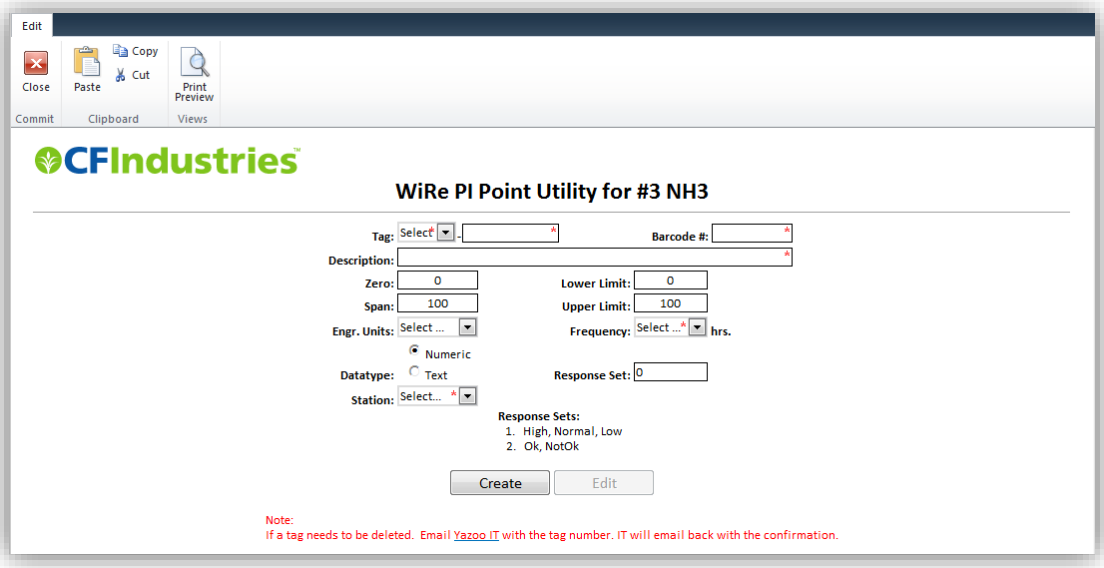
Plant KPI's (cont.)

- PI Gauge web part is used for troubleshooting
- Limits of gauges are set by the KPI form

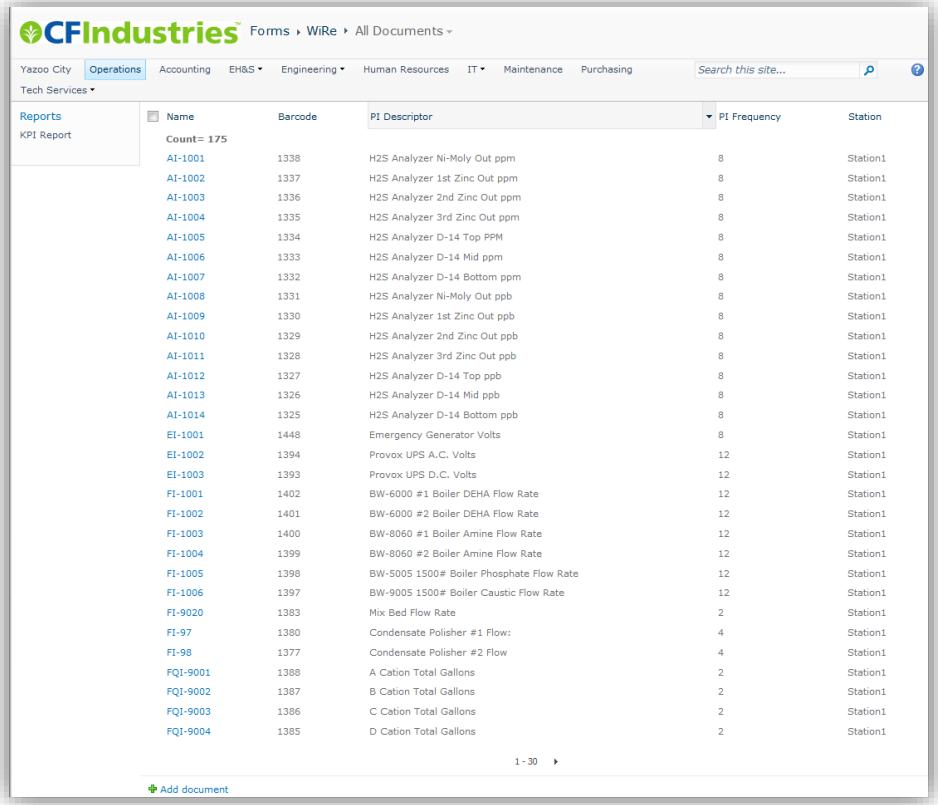


Wireless Manual Data

- WMD tags are created using an InfoPath form
- All WMD tags are represented by a saved form in the library



Wireless Manual Data (cont.)



Wireless Manual Data (cont.)

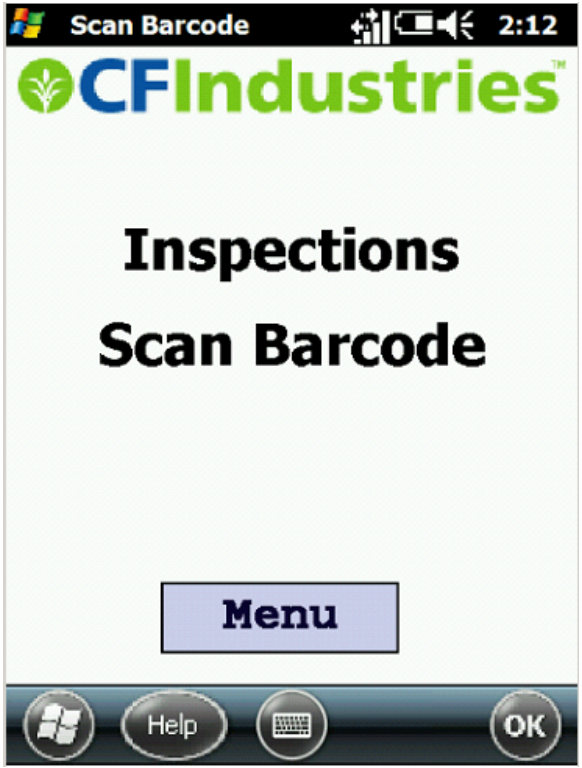
- Aluminum Barcode
  - .020 Thick
  - Text and Barcode is embedded .005

Wireless Manual Data (cont.)

- eCom i.roc® Ci70 – Ex
- Class I Div I Groups A-G
- Windows Embedded OS
- MobiControl – Device Management
- Bright Software – Data Collection
- Administered via SharePoint
- K.eep I.t S.imple

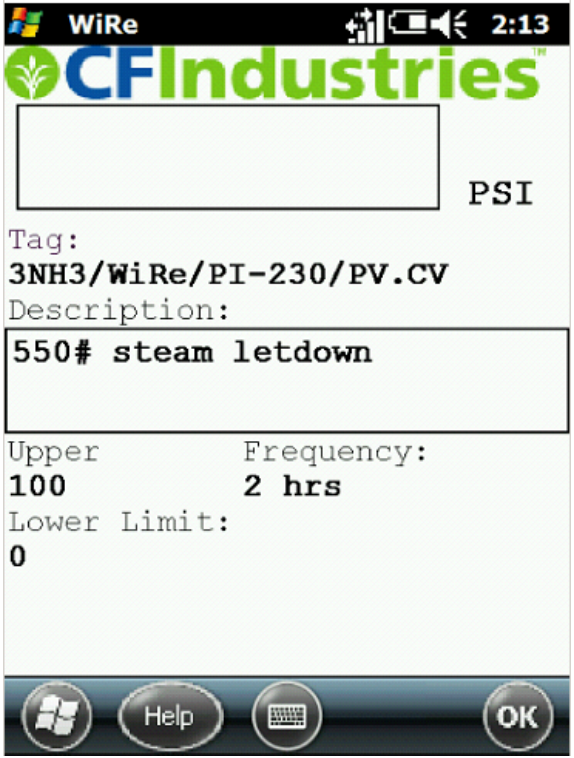
Wireless Manual Data (cont.)

- Home Screen
- Within wireless coverage, the handheld will sync every 1 min
- GUI administration is done via BrightForms utility



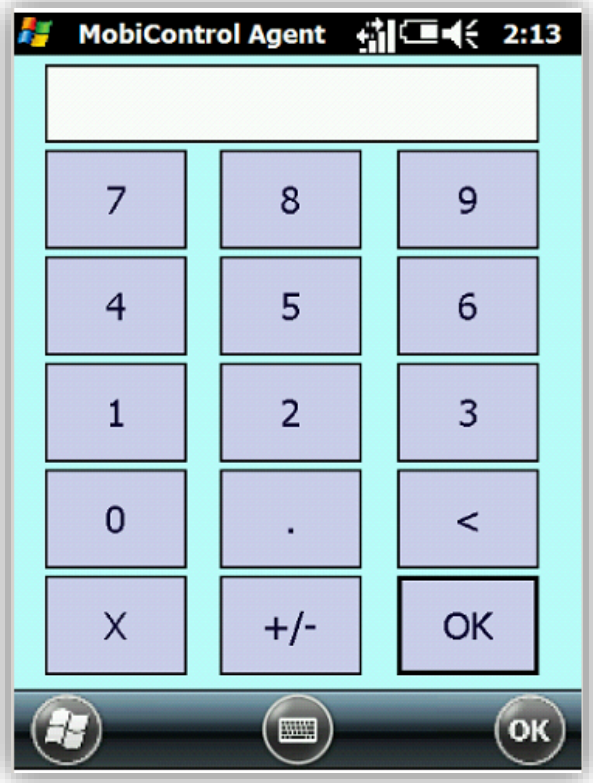
Wireless Manual Data (cont.)

- Data Entry Screen
  - Notification of upper/lower limit exceedance
  - Frequency of inspection
    - Logically concludes timestamp
- Using PI Interface for RDMS allows operators to record data that is time-stamped in the future



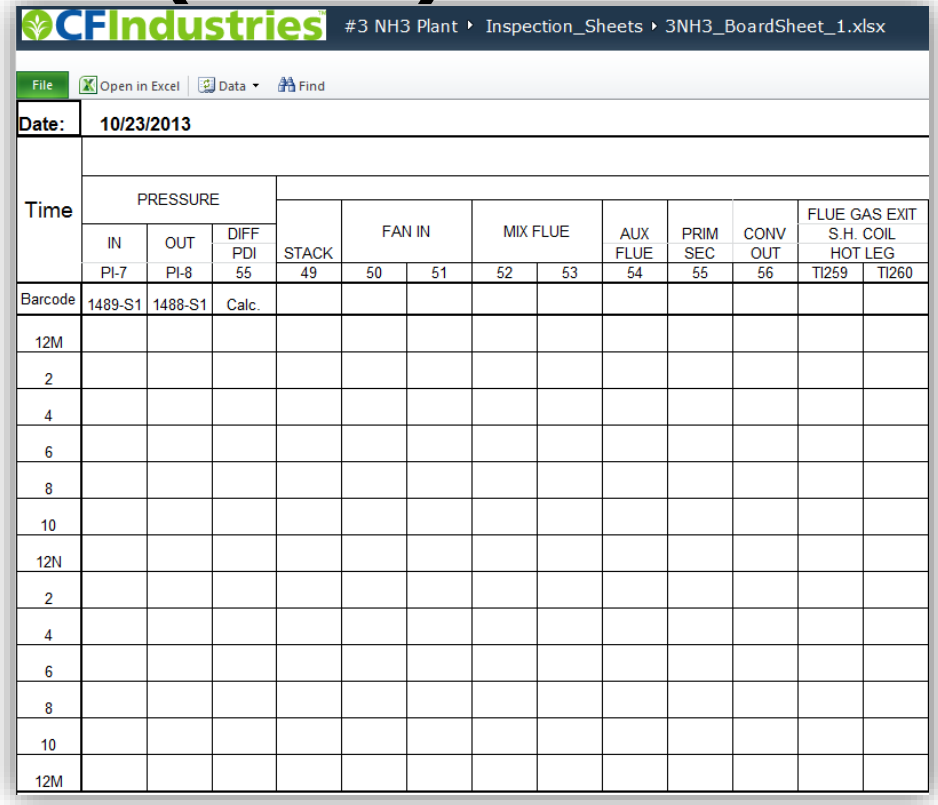
Wireless Manual Data (cont.)

- Data entry is finger friendly
  - No stylus is needed



Wireless Manual Data (cont.)

- Inspection Sheet
- Operators can review data entered
- Reference for barcodes
- PI DataLink Server


CFIndustries #3 NH3 Plant ▸ Inspection_Sheets ▸ 3NH3_BoardSheet_1.xlsx

File | Open in Excel | Data | Find

Date: 10/23/2013

Time	PRESSURE				FAN IN		MIX FLUE		AUX	PRIM	CONV	FLUE GAS EXIT	
	IN	OUT	DIFF PDI	STACK					FLUE	SEC	OUT	S.H. COIL HOT LEG	
	PI-7	PI-8	55	49	50	51	52	53	54	55	56	TI259	TI260
Barcode	1489-S1	1488-S1	Calc.										
12M													
2													
4													
6													
8													
10													
12N													
2													
4													
6													
8													
10													
12M													

Future of PI System @ CF – Yazoo City

- Mobility
  - Smart Phones
  - Tablets
- PI System integration with EAM software
  - Automation of PM work orders
- Create elements in PI AF and have PI Notification option on the form used to create tags for Wireless Manual Data
- Build out all KPI's needed to produce a single KPI for the entire complex

Bryan Pigg

bryan.pigg@cfindustries.com

Network Supervisor

CF Industries Inc.

THANK YOU

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Questions?