

Applying PI System – For Improving Process Condition & Process Optimization

Presented by

PRASAD SHINDE

ULTRATECH CEMENT LTD H.O.(Mumbai)

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Agenda

✓OSIsoft products and services.

✓ Overview of UltraTech Cement Limited.

✓ PI System Architecture at UltraTech Cement Ltd.

✓ PI Utilization at UltraTech Cement Ltd.

✓ Business Challenges & solutions.

✓ Results & benefits.

✓Case Studies

✓Future Plans.



OSIsoft Products & Services

- PI Enterprise server
- PI Server 2010 with PI AF(Asset Framework)
- PI-OPC DA Interface
- PI-Modbus Interface
- <u>PI ProcessBook:-</u> On line data monitoring & trending.
- PI DataLink:- Graphical interface to retrieve data & build function & calculations.
- <u>PI AlarmView:</u> Overall alarm structure & detailed information on specific points.
- <u>PI SQC Client:-</u> Extensively used in quality control.
- PI Profile View
- PI Batch View
- <u>PI Notifications:-</u> Instant communication through email & sms.
- PI System Mangement Tool(SMT)
- PI Manual Logger
- PI SDK



UltraTech Cement Limited ULTRATECH LOCATIONS (in INDIA) Manufacturing locations 11 Integrated Plants 1 White Cement Plant 1 Clinkerisation plant in UAE 15 Grinding Units 11 in India arsuguda Cement Works 2 in UAE Jafrabad Cement Works Cement Wor 1 each in Bahrain & Bangladesh **5** Bulk Terminals RatnagiriCement We 4 in India 1 in Srilanka 73 RMC(Ready Mix Concrete) units Integrated plant Grinding unit

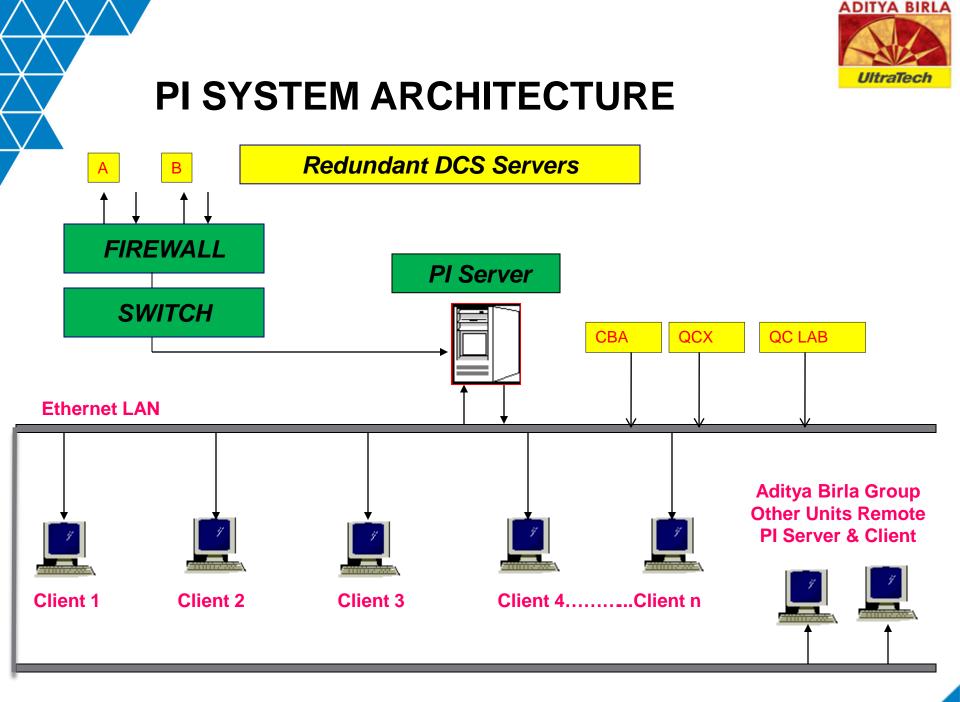
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Overview of UltraTech Cement Limited

- Flagship company of Aditya Birla Group.
- Eighth largest cement producer in the world.
- Grey Cement annual capacity 52 MTPA(Includes ETA Star Cement).
- White Cement annual capacity 0.55 MTPA.

We are committed to Green, Clean and Safe environment.



6



PI System Utilization at UltraTech Cement Ltd.

- Bring all relevant data from various sources such as operational data sources on a single platform.
- Appropriate access of data provided to engineers based on roles & delivered in uniform & consistent manner.
- Real time data collection used for study & analysis.
- Generation of shift/daily reports through PI DataLink utility.
- Monitoring of real time data through PI ProcessBook & generation of user specific reports for particular equipment or section.
- Reports generated used for necessary action & improvement.



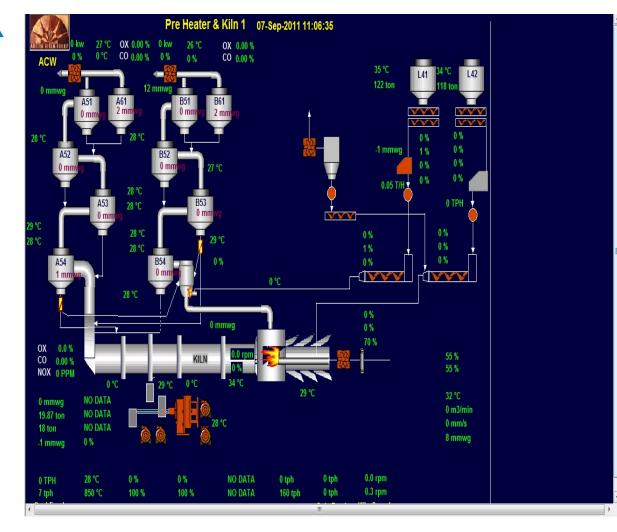
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Generation of report for critical parameters of section



Real time data monitoring



Monitoring of real time data for study & analysis



PI Notifications through Email

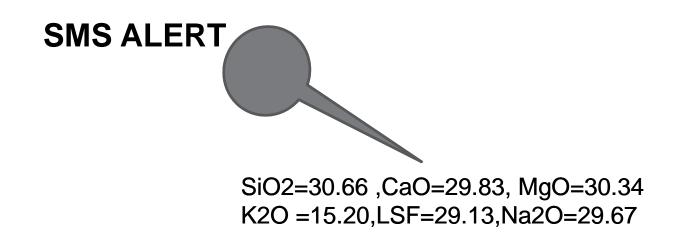
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PI Notifications through SMS

- Instant updates of critical parameters through SMS on mobile.
- E.g.:- Quick information of quality parameters to the Mines department for corrective action without information from QC department.







PI System Utilization at UltraTech Cement Ltd.

- On line SQC to predict potential process as well as quality problem.
- Huge database for analyzing plant behaviour in different process condition.
- Monitoring process & identify root causes of problem to reduce unaccounted losses.
- Performing condition based maintenance & reduce equipment downtime through predictive maintenance.



Business Challenges

- Execution of PI System in power plants.
- Process & Quality control parameters through online SQC tool.
- Manual data entry in PI System.



Business solution



PI System execution in power plant

- Integrated power plant DCS data in to PI System by PI-OPC DA interface
- Configuration was done with Interface PC(for buffered data) & Hardware firewall.
- Allowed access to 5450,135 ports & all other ports blocked for secured communication.
- Real time information for boiler & turbine accessories through PI ProcessBook.
- Generation of power reports & data analysis through PI DataLink
- Capturing of millisecond timestamp for having the sequence of events records to enhance the analysis.

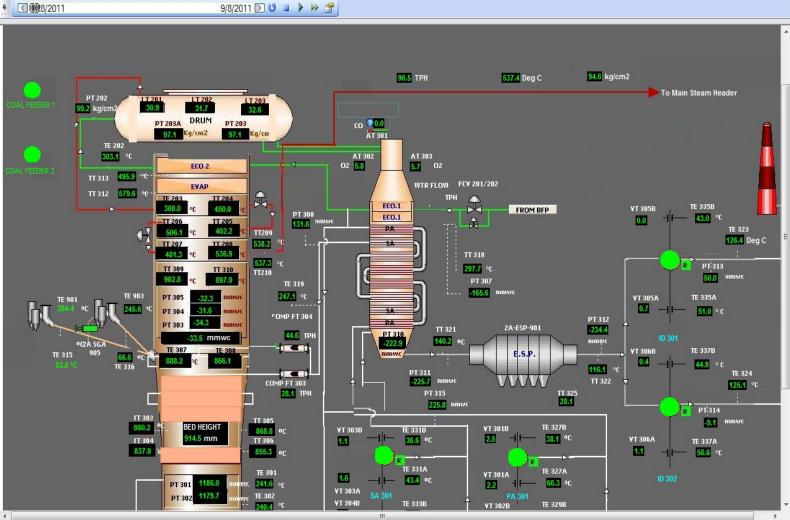


BOILER OVERVIEW



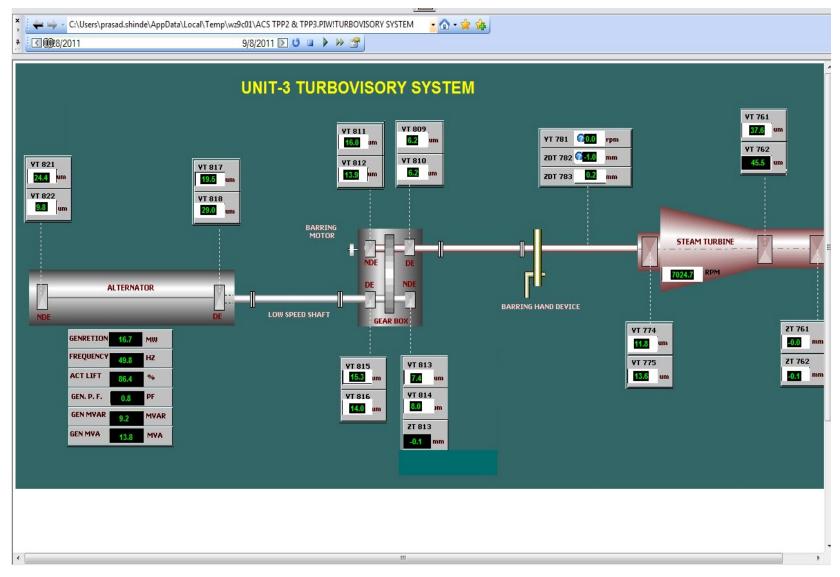
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TURBINE OVERVIEW



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OVERALL OVERVIEW

BOILER PARAMETERS TURBINE PARAMETERS
UNIT-2 UNIT-3 UNIT-2 UNIT-3
MAIN STEAM PRESS 0.3 kg/cm2 95.6 kg/cm2 TURBINE SPEED 5835.4 RPM 7023.9 RPM MAIN STEAM TEMP 29.4 deg C 537.8 deg C GENERATOR MW 6.3 MW 16.8 MW
MAIN STEAM FLOW 0.6 TPH 103.6 TPH GENERATOR FREQ 49.2 HZ 49.8 HZ
FURNANCE PRESS 0.8 mmwc -33.4 mmwc GENERATOR PF 0.8 PF 0.8 PF
ACTUAL BED HEIGHT 1.4 mm 909.8 mm GENERATOR MVAR 4.8 MVAR 9.2 MVAR
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Millisecond timestamp Data capturing

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To have sequence of events record for data analysis



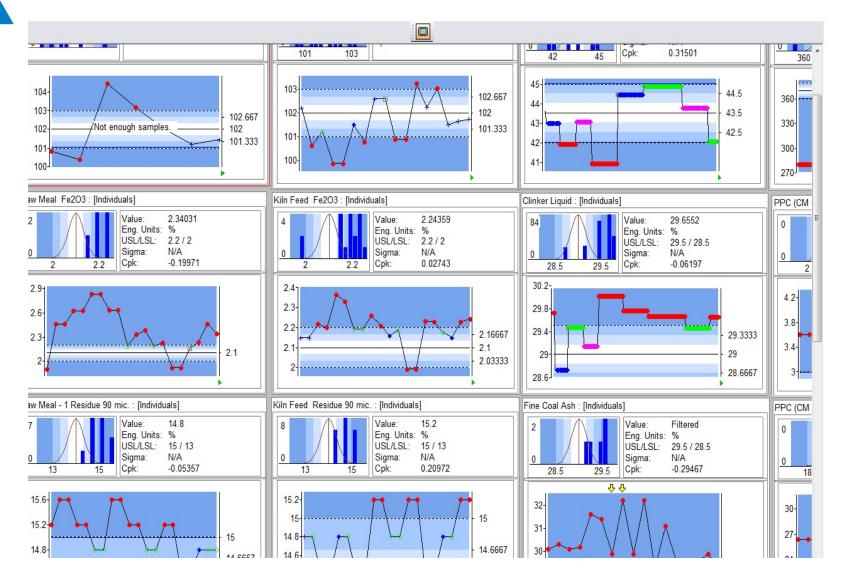


Quality parameters through SQC tool

- On line trends of critical quality control parameters.
- Corrective actions based on SQC trends.



Online SQC trends



20





MANUAL ENTRY OF QUALITY PARAMETERS

- Quality data entered in to PI System by manual entry log sheet.
- Sending & reading of data from PI System developed through VB Script.
- QC people enter hourly, monthly data in PI System by manual entry log sheet, & use the same for analysis.
- Compilation of PI data from different units for report generation at plant & corporate level.



MANUAL DATA ENTRY IN PI SYSTEM

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RESULTS & BENEFITS

- Real time performance management.
- Positive results in terms of investment, process.
- Quick information of real time & historical data to right people for informed business decision.
- Process data to concerned individuals for effective process management & efficient data analysis & reporting.
- Optimization of production
- Predict & minimize unplanned outages based on real time usage information.

ADITYA BIRLA UltraTech

PLANT OPERATIONAL RELATED DATABASE & KNOWLEDGE MANAGEMENT

- Integration of all data from different platforms eg- process parameters, Laboratory analysis, Energy management, analysers etc.
- Transparency of data i.e. availability of information to everybody in the organisation.
- Inter unit access of data through WAN.
- Communication with Central control room minimized.
- Plant information related database are used as an input for process optimization, troubleshooting & also provide an information for effective deployment of predictive & preventive maintenance.
- Availability of data history for study & analysis.

CASE STUDIES



1 Process optimization of Girth Gear Lubrication system

- Normally automatic interval spray lubrication used where applied lubrication volume is controlled by spray.
- <u>Problem addressed:-</u> Cement Mill Girth Gear grease consumption was very high.
- <u>Action taken:-</u> Grease Consumption was optimized by spray lubrication ON/OFF time.

Checking for ON/OFF time was done by the concerned engineers through PI system & hence optimized the spray pattern by setting ON/OFF time.

• <u>Results:-</u> Girth Gear grease consumption was reduced & benefits were achieved.



Observations through Trend

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2 Improvement in Maintenance

- Increase in equipment safety by identifying & preventing potential based problems through condition based maintenance programs.
- Reduction in production downtime & lower maintenance costs.
- Repairing & replacement of spares based on running hours of plant equipment for efficient production.
- Timely alerts through PI System regarding maintenance of equipment e.g. replacement of lubricants in equipments based on running hours.



Equipment Run hour report

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	5	751CR1	23.9891	15.8682	23.2682	23.9613	22.5682	21.0402	24.0002	23.5057	18.39	17.6379	5.23226	11.9223	20.1668	16.6224	19.7696
	6	721BM1	21.77	23.9833	23.9833	2.88279	18.2639	8.23833	18.0505	23.9833	23.3115	23.8533	23.0425	23.9833	21.9678	23.9833	13.9122
	7	721CP1	22.1318	24.0002	24.0002	3.11752	18.421	7.51369	18.2793	9.4987	10.1809	0	0	0	0	0	4.81864
	8	721CP2	0	0	0	0	0	0	0	14.4987	7.91172	24.0002	23.626	24.0002	24.0002	24.0002	9.66203
	9	761CP1	17.7835	16.3515	16.0348	15.6176	9.4548	8.96061	6.33643	6.40951	15.9272	14.7643	21.9894	18.3293	14.836	16.1337	13.7262
	10	761CP2	9.83982	0	0	0	6.89646	8.79534	2.56001	6.54451	9.41634	0	0	0	0	0	0.80859
	11	761CP3	8.45478	16.3529	16.0321	15.619	2.4153	0	3.70836	9.09894	6.71088	14.2518	22.1602	18,1307	14.836	16.3462	13.6445
	12	761CP4	4.21126	4.82555	5.5601	0	4.25056	6.29258	2.51817	0.3764	6.25375	7.56014	14.5448	12.2193	11.3305	11.9811	10.0454
	13	761CP5	8.33045	6.06372	4.5753	10.7085	1.62922	0	2.43227	9.92103	4.99691	2.86937	0	0	0	0	0
	14	761CP6	0	0	0	3.16585	0.63006	0.86387	0	0	0.06804	0	0	0	0	0	0
	15	821CP1	0	0	0	11.0626	0.37639	8.52785	0	0	0	0	0	0	0	0	5.90839
	16	821CP2	7.11117	0	0	2.4653	0	0	0.12777	0	0.59168	0	2.7028	0	0	0	0.05277
	17	821CP3	6.51672	0	0	9.52839	5.45783	8.92229	1.09723	0	0	0	2.70558	0	0	0	0
	18	900RWP	0.94417	4.79311	0.94029	0.95834	5.85977	1.38195	0.89306	1.93056	0.93612	0.95835	1.59167	3.41392	0.99167	1.85418	3.33474
	19	900DWP	12.289	10.789	8.64505	9.22176	15.2904	9.94869	10.01	14.0126	7.7209	9.50841	8.33757	6.85839	11.5476	10.3776	9.69454
	20	900PWP2	24.0002	24.0002	24.0002	9.65092	18.2965	9.93286	18.099	24.0002	18.4238	24.0002	23.6535	24.0002	24.0002	24.0002	17.4099
	21	900PWP1	0	0	0	9.27147	11.4968	6.24476	3.79276	0	0	0	0	0	0	0	2.03612
	22	900HWP	24.0002	24.0002	24.0002	24.0002	24.0002	19.9874	24.0002		18.4224	24.0002	23.4938	24.0002	24.0002	24.0002	21.0835
	23	900CTF	24.0002	24.0002	24.0002	23.9835	19.6071	16.729	24.0002	24.0002	18.4238	24.0002	23.6924	24.0002	24.0002	24.0002	19.8182
	24	761BL1	0	0	0	0	0	0	0	0	0	1.88723	22.3424	18.3321	15.4068	17.3671	15.2751
	25	761BL2	18.282	16.9057	15.8557	15.664	9.73897	9.48147	6.68783	12.3723	17.2262	12.5448	0	0	0	0	0
	26	761BL3	0	0	0	0	0	0	0	2.26971		0	0.12110	0	9.56979	18.7793	13.8362
	27	761BL4	18.8779	23.9946	24.0002	3.04948	18.341	7.24118	18.1504	16.5596	7.91189	24.0002	23.1105	22.6363	9.06091	0.06112	0
	28	761BL5	22.096	23.9877	24.0002	3.06615	18.3382	7.25785	18.1476	14.0721	17.9623	24.0002	8.31449	22.6502	22.8405	24.0002	13.8501
	29	761BL6	0	0	0	0	0	0	0	6.62532	0	0	15.2168	0	0	0	0





On line conditioning monitoring of equipment

- Monitoring of motor winding, bearing temperature, motor fan, speed, kw, vibration through PI ProcessBook application.
- Comparison of the above concerned parameters based on concerned sections for study, analysis & hence performing corrective action when required.



On line conditioning monitoring of equipment

	W1W03	W1W06		BH FAN	KS FAN	CS FAN	ESP FAN	I HAM CF	R RM FAN	RM MM	KM FAN	KM MM	BOS FAN	FAN 48
GEAR BOX - BRG	52 degc	51 degc	MOTOR WDG1	91 degc	66 degc	91 degc	69 degc	51 degc	74 degc	98 degc	80 degc	73 deg	30 degc	49 degc
GEAR BOX - BRG	55 degc	52 degc	MOTOR WDG2	91 degc	68 degc	95 degc	69 degc	52 degc	78 degc	101 degc	77 degc	72 degc	30 degc	49 degc
GEAR BOX - BRG	54 degc	56 degc	MOTOR WDG3	90 degc	66 degc	91 deg	70 degc	53 degc	73 degc	99 degc	79 degc	72 deg	30 degc	49 degc
GEAR BOX - BRG	50 degc	54 degc	MOTOR WDG4	91 degc	68 degc	90 degc	69 degc	51 degc	71 degc	96 degc	75 degc	57 degc	31 degc	49 degc
MAIN MOTOR - WDG1	58 degc	59 degc				94 degc								
MAIN MOTOR - WDG2	56 degc	55 degc	MOTOR WDG6	91 degc	67 degc	93 degc	68 degc	51 degc	76 degc	98 de	ISERVERIG	W1 RM TE	MP MILL MA	IN MTR WDG
MAIN MOTOR - WDG3	57 degc	54 degc	MOTOR BRG1	42 degc	41 degc	43 degc	42 degc	39 degc	48 degc	44 de (8/	12/2011 3:0	08:40.0460	1 PM)	
MAIN MOTOR - WDG4	57 degc	55 degc	MOTOR BRG2	46 degc	52 degc	64 degc	50 degc	36 degc	51 degc	58 degc	38 degc	46 degc	35 degc	35 degc
MAIN MOTOR - WDG5	57 degc	57 degc	MACHINE BRG1	56 degc	71 degc	57 degc	59 degc	68 degc	53 degc		54 degc		34 degc	
MAIN MOTOR - WDG6	56 degc	53 degc	MACHINE BRG2	53 degc	61 degc	59 degc	49 degc	57 degc	56 degc		48 degc		46 degc	
MAIN MOTOR - BRG1	40 degc	41 degc												
MAIN MOTOR - BRG2	46 degc	52 degc				COAL MIL	L	10400						
PIER1 ROL BRG (RU)	50 degc			GAS TEM 74 degc	74 degc	-	4P 1	L04 BIN 63 degc	LOS BIN					
PIER1 ROL BRG (LD)	51 degc		KM B/H CH#1 KM B/H CH#2	73 degc	73 degc		MP 1 MP 2	65 degc						
PIER1 ROL BRG (LU)	49 degc		KM B/H CH#2	75 degc	73 degc		MP 3	67 degc						
PIER1 ROL BRG (RD)	53 degc		KM B/H CH#4	73 degc	73 degc		MP 4	51 degc						
PIER2 ROL BRG (LD)	55 degc		KM B/H CH#5	73 degc	73 degc		4	51 degc	oz dege					
PIER2 ROL BRG (RD)	57 degc		KM B/H CH#6	73 degc	74 degc									
PIER2 ROL BRG (RU)	53 degc		KM B/H CH#7	73 degc	74 degc									
PIER2 ROL BRG (LU)	48 degc		KM B/H CH#8	73 degc	73 degc									
PIER3 ROL BRG (RD)	45 degc		KM B/H CH#9	73 degc	73 degc									
PIER3 ROL BRG (RU)	44 degc		KM B/H CH#10	74 degc	73 degc									
			KM B/H CH#11	73 degc	74 degc									
PIER3 ROL BRG (LU)	44 degc		KM B/H CH#12	73 degc	74 degc									
PIER3 ROL BRG (LD)	50 degc													





3 Process optimization through PI AF Utility

- More focus on user centric objects called elements, & less focus on PI tags
- Organizing & structuring PI data, by having an asset model according to the objects that users are more familiar with.
- AF(Asset Framework) basically based on element, user oriented objects that reference PI data.
- Use of PI system explorer to create databases in AF, according to the user requirements.
- Monitoring & analysis of Data through PI AF on single screen.

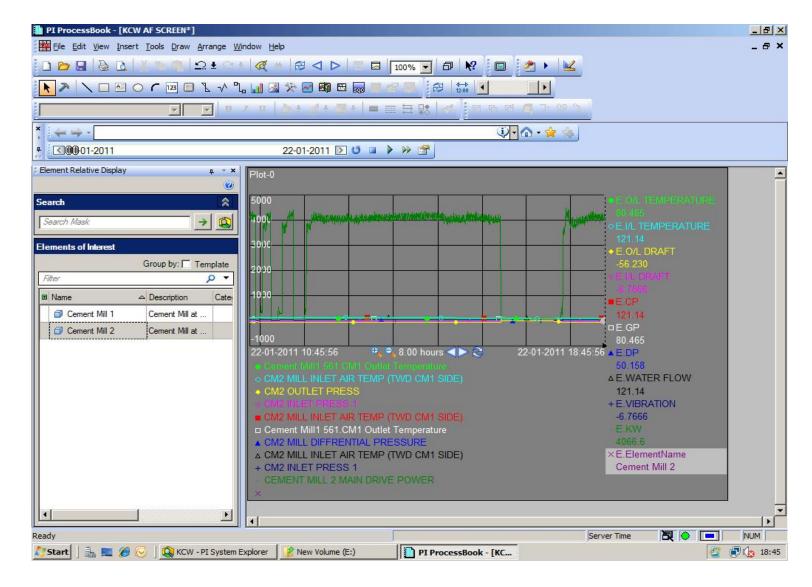


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ement Mill 1	Filter		<mark>ب</mark> م	Name:	DP						
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oal Mill ooler	CP	120.765602111816 bar		Configuration Item:							
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	67 I/L DRAFT	-1.26369953155518 bar		Value Type:	Double						
	🧭 I/L TEMPERAT	95.3831481933594 °C		Value:	2.21587228775024 bar						
	KW	3.13939118385315 kW		Data Reference:	PI Point						
	6 O/L DRAFT	0.295028686523438 bar			Settings						
	🧭 O/L TEMPERA	87.0817260742188 °C		\\PISERVER-KCW	/\KCW CM1 561CM1 DPT						
	VIBRATION	79.6635437011719 mm/s									
	VATER FLOW	0 m3/h									
	-111										



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🗃 Cement Mill 2 🎯 Coal Mill	2:	Name 4	≤ Value		Description:	
🗃 Cooler		K BED HEIGHT 1	1077.68371582031 mm		Configuration Item	
🗇 Kiln 🎯 Raw Mill		SED HEIGHT 2	901.441955566406 mm		Categories:	
test1		SED HEIGHT 3	1007.82788085938 mm		UOM:	millimeter
		K BED HEIGHT 4	1402.24304199219 mm		Value Type:	Double
		SED HEIGHT 5	1043.53393554688 mm		Value:	1077.68371582031 mm
		🧭 BED HEIGHT 6	2999.99975585938 mm		Data Reference:	PI Point
		K BED HEIGHT 7	0.274662405252457 mm			Settings
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Future Plans

- Extension of PI System to majority of power plants.
- Implementation of PI statistical tools in all group units.
- Implementation of web based application like PI WebParts.
- Data capturing from Lab equipments.
- Connecting PI Server to Smartphone's for display of trends/status.