Expanding *Existing* Technologies

Essential Expertise for Water, Energy and Air SM

2013 WRBA, Portland, Oregon

Meeting Operation Objectives for Your Boilerhouse

- Sustainability
- Maintainability
- Regulatory (MACT)
- Economic

4 Case Studies

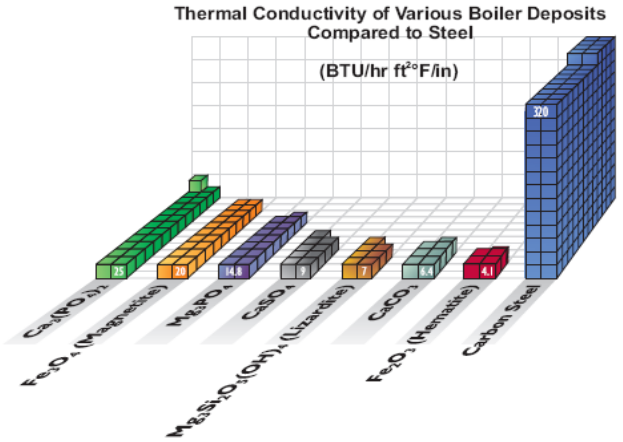
1. Boiler Cycle Control
2. Amine Feed and Chemistry Automation
3. Boiler Efficiency Reporting
4. Enhanced, automated reporting

Case Study #1

BOILER CYCLE CONTROL

Cycle Control

- Med-High Purity water (RO or DI)
- High Cycles of Contration (100 cycles, 1% Blowdown)
- Excessive cycles
  - Long Holding Times
  - More “looks” at the radiate heat zone
  - Breakdown of treatment chemistry
  - Concentration of conteminants



Cycle Control

- Condenser Leak
  - Total Hardness increased from <30 ppb to 170 ppb
  - Favorable Power/Hog pricing precluded shutdown
- Increased Treatment to match contamination
  - PID Trasar control set point increased form 2.4 to 8 to 5 ppM
- Old “Boiler Conductivity Limit” didn’t apply
- Boiler Quickly brought back into limits
  - Consistent treatment in Feedwater
  - 30 second Operator test of boiler water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Global Gateway
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CAUTION

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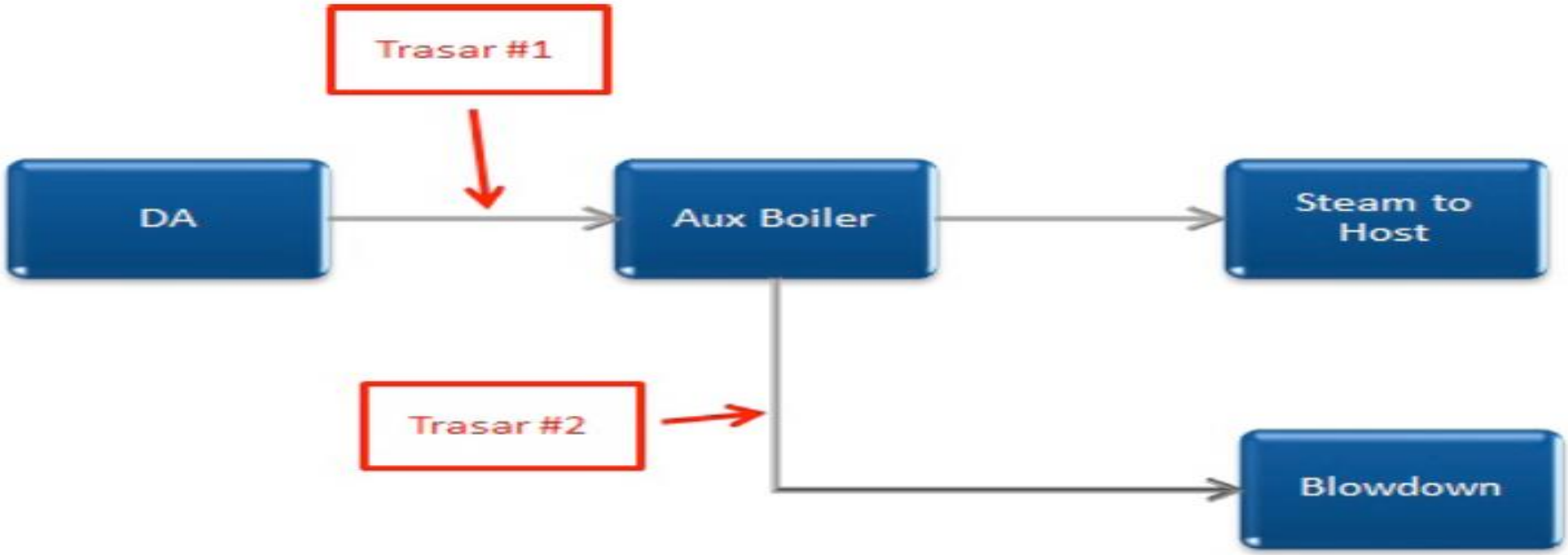
Case #2

- High Purity Make-Up
- Variable Condensate Quality and Quantity
- Continuous Monitoring
  - Feedwater
  - Blowdown



Feedwater 3D Trasar

Blowdown 3D Trasar

Case Study #2

AUTOMATED AMINE CONTROL

Case #3

- Amine largest component of Condensate specific conductivity
  - High % make-up OR med-high purity Make-up
- Amine control using conductivity common in Power Industry
- Conductivity is very reliable, compared to pH
- Feedback control is BEST

Amine Control

- Utilized Existing Controller
- Feedwater conductivity already monitored
- Utilized existing capabilities
  - 4-20 ma output (1 of 8)
  - PID algorithm
  - 4-20 ma capable Prominent pump

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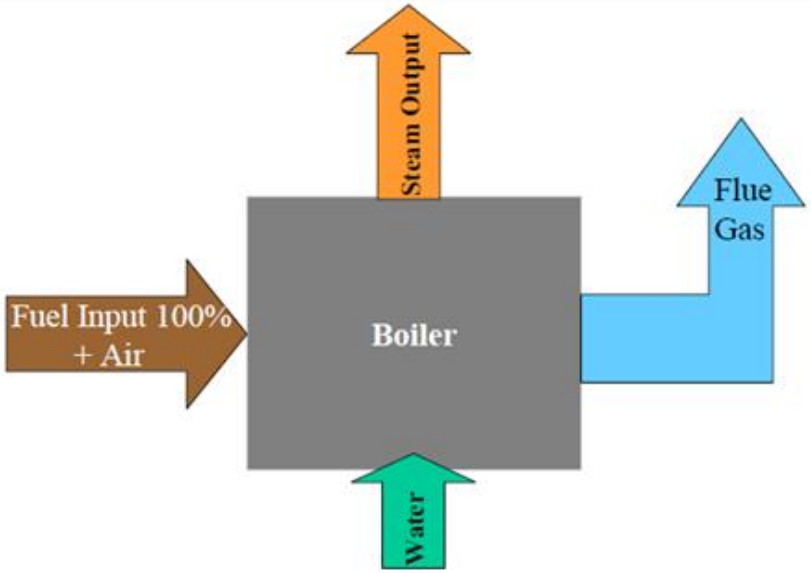
Operational Efficiency

KPI VISIBILITY GENERATES OPPORTUNITIES FOR EFFICIENCY GAINS IN BIO-MASS FIRED STEAM PLANTS

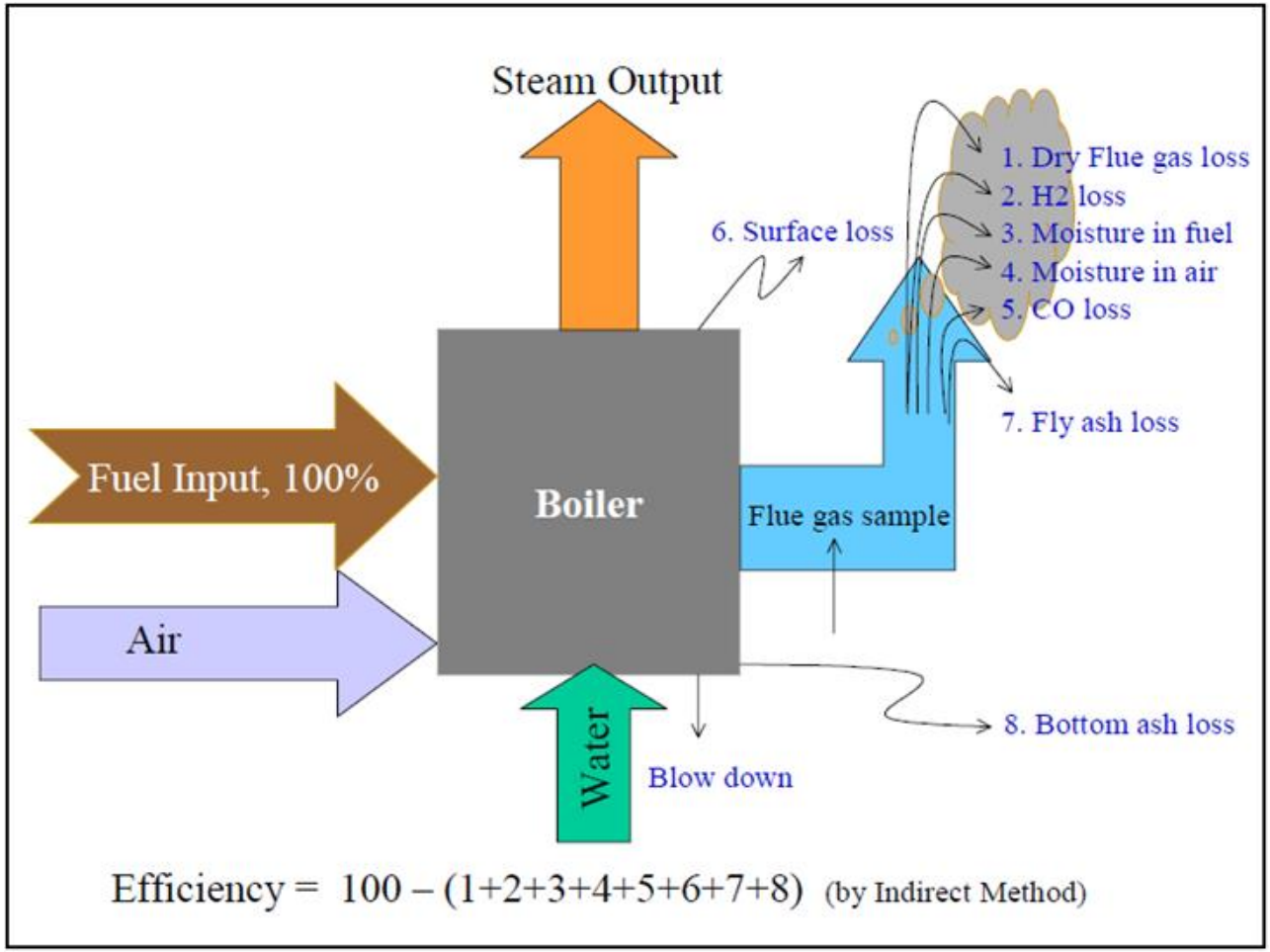
Boiler Efficiency



$$\text{Efficiency} = \frac{\text{Heat addition to Steam x 100}}{\text{Gross Heat in Fuel}}$$

$$\textit{Boiler Efficiency} = \frac{\text{Steam flow rate x (steam enthalpy} - \text{feed water enthalpy)}}{\text{Fuel firing rate x Gross calorific value}} \; x\,100$$

Many Variables



Grab Sample Trending Tedious and Feed Back

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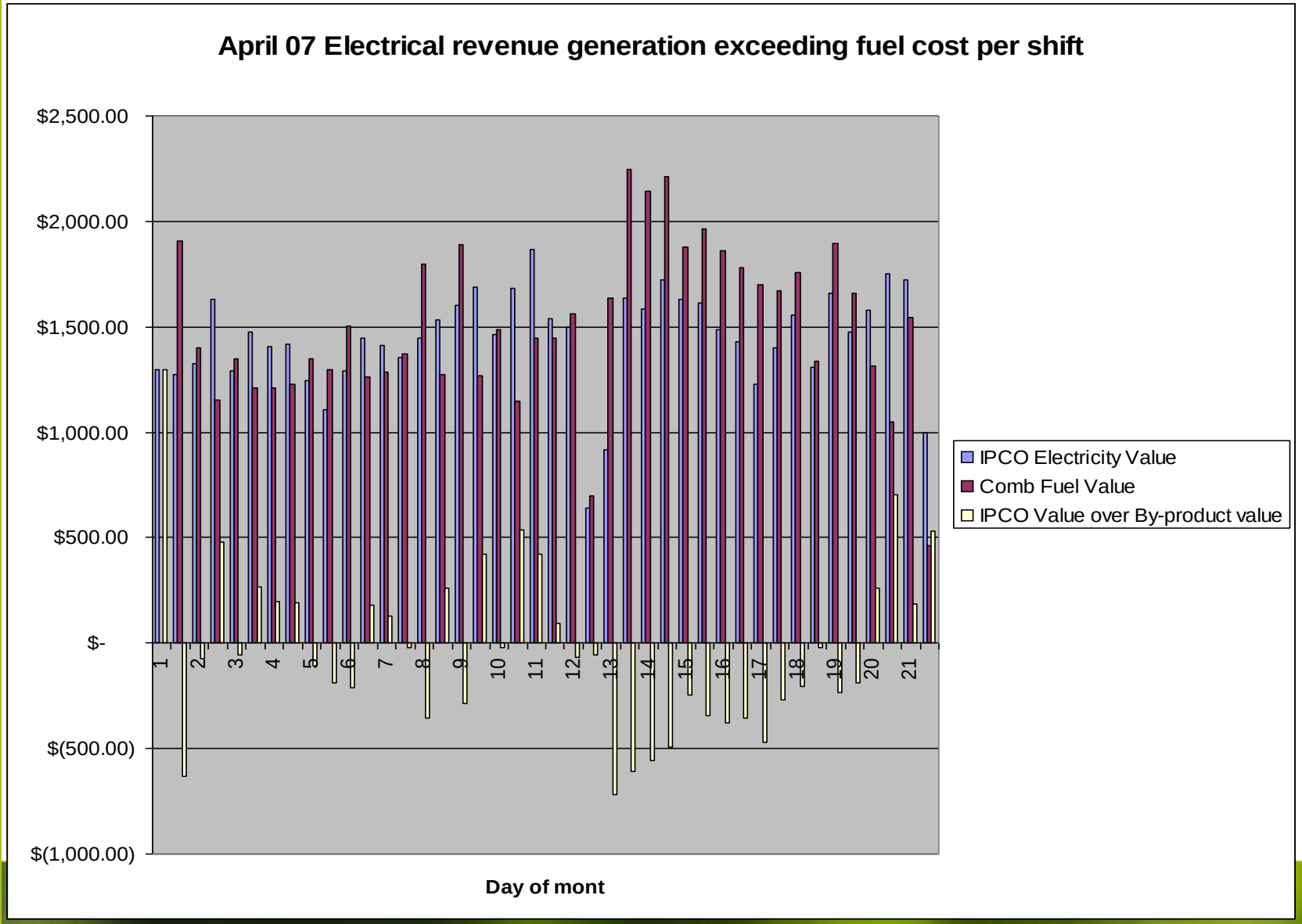
April 07 Electrical revenue generation exceeding fuel cost per shift
$2,500.00
$2,000.00
$1,500.00
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IPCO Electricity Value
Comb Fuel Value
IPCO Value over By-product value

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An Ecolab Company

Automated System Report

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3D TRASAR TECHNOLOGY

Data Dashboard - Last 30 Days

Parameter Name	Status	Date / Time	Latest Value	Avg.	Min.	Max.	St. Dev.	Low Critical Limit	Low Limit	High Limit	High Critical Limit
TRASAR (ppm) (ppm)		3/11/2013 8:50:00 PM	8.19	9.02	-1.17	22.83	2.77	0	4	25	50
Turbidity (NTU) (NTU)		3/11/2013 8:50:00 PM	16.5	32.52	2.7	294	59.29			50	150
Cell Fouling (%) (%)		3/11/2013 8:50:00 PM	15	13.27	0	77	4.92			20	100
AT ORP1 (mV) (mV)		3/11/2013 8:50:00 PM	-672	-613.98	-709	-313	54.44	-900	-800	-100	0
CS Temp (°F) (°F)		3/11/2013 8:50:00 PM	59.93	63.06	43.21	85.39	4.48	35	50	110	140
FW Sample Temp (°F) (°F)		3/11/2013 8:50:00 PM	181.23	181.6	48.73	205.45	37.32	50	150	500	550
Steam Flow		3/11/2013 8:50:00 PM	24698	36031.5	8661.5	63257	10495.3				
1720 Pump		3/11/2013 8:50:00 PM	0	0.03	0	100	1.5				
FW pH		3/11/2013 8:50:00 PM	10.87	10.64	9.94	11.34	0.22	7	8	11	13
22310 Pump		3/11/2013 8:50:00 PM	50	33.1	0	50	22.55				
Feedwater Conductivity		3/11/2013 8:50:00 PM	117	115.76	0	1286	75.75				
Feed screw 1		3/11/2013 8:00:00 PM	14.23	25.9	-0.91	54.98	12.05				
Feed screw 2		3/11/2013 8:00:00 PM	15.24	27.71	-0.91	55.78	12.92				
MU Valve		2/11/2013 2:10:00 PM	0	-0.96	-1.52	0	0.73				
Conductivity Average 1		3/11/2013 8:50:00 PM	3936	4037.16	1084	5183	356.76	2500	3000	4500	5000
Make Up Meter		10/26/2012 1:30:00 PM	0	0	0	0	0				
Water Meter 3		3/11/2013 8:50:00 PM	735320	475919	270	999960	290681				
ID Fan Speed		3/11/2013 8:50:00 PM	24.01	49.96	12.34	92.05	21.27				
ESP Purge Air		3/11/2013 8:50:00 PM	578.64	580.72	539.7	625.95	14.6				
FD Fan Speed		3/11/2013 8:50:00 PM	0.01	26.2	-0.01	100.11	42.65				

Fuel MC	50	%
$/BDT	$ 30.00	$
Heat Value	7200000	BTU
BTU /LB Steam	200	BTU
Steam Production	432,000,000.00	60K 300 Days
Annual Btu Input	86,400,000,000.00	BTU
Annual BDT Input	12,000.00	BDT
Annual Fuel $	$ 360,000.00	$

Fuel MC	30	%
$/BDT	$ 30.00	$
Heat Value	11400000	BTU
BTU /LB Steam	200	BTU
Steam Production	432,000,000.00	60K 300 Days
Annual Btu Input	86,400,000,000.00	BTU
Annual BDT Input	7,578.95	BDT
Annual Fuel $	$ 227,368.42	$

1-Steam Flow

2-Feed screw 1

14. Feb

20. Feb

Environmental Protection Agency

40 CFR Part 63
National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers; Final Rule

Horsepower: 150
% full load: 50 %
Motor Nameplate Efficiency: 82.1 %
Annual operating hours: 8000 hours/year
Electric cost: .05 /kWh

Annual cost estimate between: $24500/ year and $29900/ year.

Horsepower: 150
% full load: 75 %
Motor Nameplate Efficiency: 82.1 %
Annual operating hours: 8000 hours/year
Electric cost: .05 /kWh

Annual cost estimate between: $36700/ year and $44900/ year.

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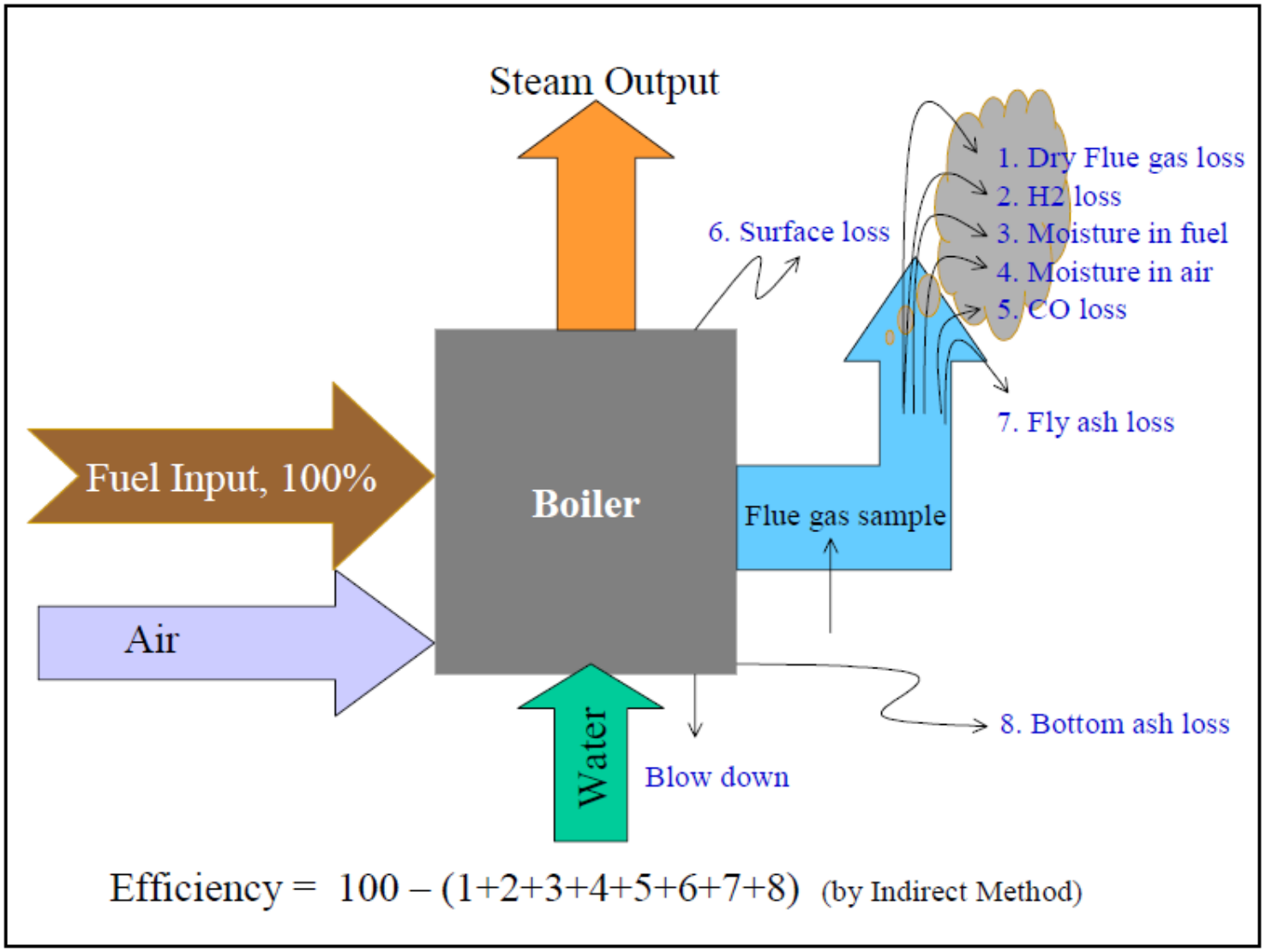
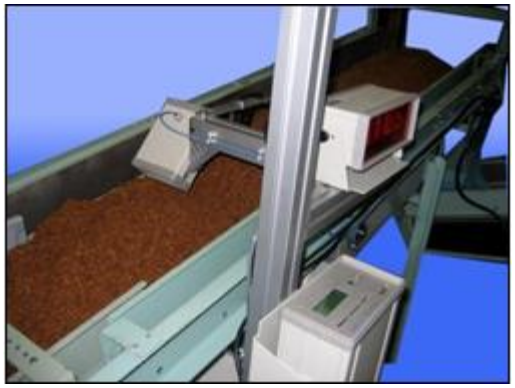
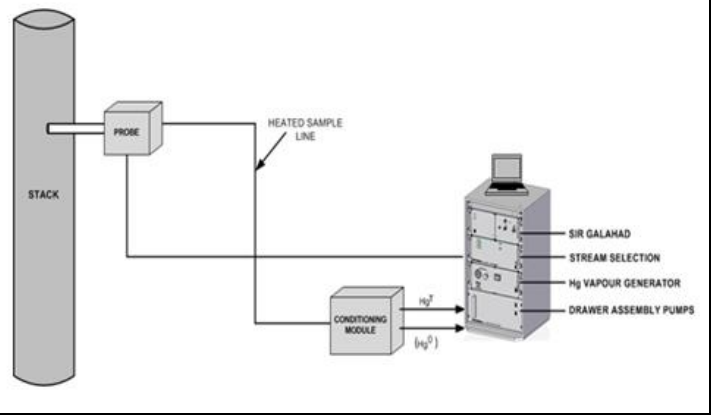
14. Feb 16. Feb 18. Feb 20. Feb


Steam Output
1. Dry Flue gas loss
2. H2 loss
3. Moisture in fuel
4. Moisture in air
5. CO loss
6. Surface loss
7. Fly ash loss
Fuel Input, 100%
Boiler
Flue gas sample
Air
Water
Blow down
8. Bottom ash loss
Efficiency = 100 – (1+2+3+4+5+6+7+8) (by Indirect Method)

What are you measuring?





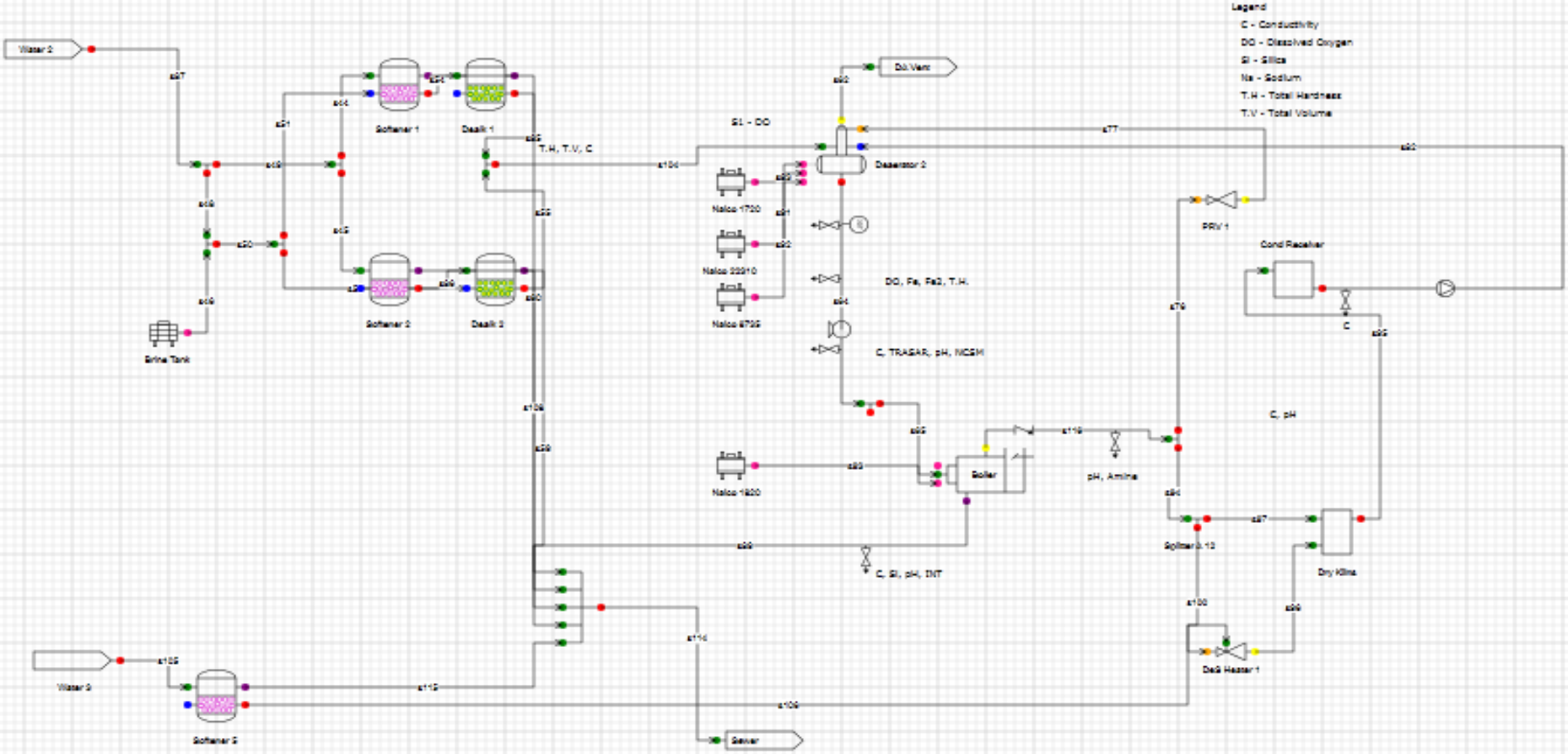
NalcoPRO

(1041209/)

A0 - 841mm | My Diagrams

Edit: Copy | Cut | Paste | Undo | Redo | Delete | Text

View: Grid | Ports | UnitOp Labels | Stream Labels | Missing | Process | Input




"HOG" fuel
TYPICAL STORAGE AND FEED PROBLEMS




7.49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