ILD Condenser and Cooling Tower Model

Description:

The ILD Condenser Model can be used to determine current condenser performance. Additionally, "predictor" cases can be run to see how varying different parameters will affect condenser performance. The results of the predictor cases also show how the changes will affect gross generation output. The design cooling tower curve data is incorporated as well, so that cooling tower performance can be evaluated. All of this information can be used to determine the impact of changing condenser and cooling tower performance on gross generation.

Using the Model:

The main interface page of the condenser model is the "User" worksheet. From this worksheet, the user can view the current condenser and cooling tower performance as well as use the Predictor Model features to postulate how changes in condenser operating conditions will effect the generation. The following is a summary of the features available:

Current Condenser and Cooling Tower Conditions

Get New Data – Allows you to collect current plant data using the PI Server.

Print Raw Data Only - This feature allows you to print out a summary of the current raw data that is being used in the Condenser Model.

Change Number of Plugged Tubes in Condenser – This allows you to change the number of tubes CURRENTLY plugged in each condenser section.

Condenser Results – The current condenser performance is determined based on the apparent overall heat transfer coefficient "U." Other displayed performance parameters include circulating water flow, circulating water inlet and outlet temperature, cooling tower range, predicted cold water temperature and the MW loss associated with degraded condenser and cooling tower performance.

Predictor Case Functions

Each of the functions below allows you to change the operating conditions of the condenser. Multiple functions may be used together to predict generation at any given condenser conditions.

Change Circulating Water Inlet Temperature – This feature allows you to change the circulating water inlet temperature. The outlet temperature is calculated based on the heat load.

Change Circulating Water Flow – This feature allows you to change the circulating water flow rate to postulate operation with a varying number of pumps.

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Plug Additional Condenser Tubes – This feature allows you to add (or subtract) additional plugged tubes in each condenser section. This number is added to the existing number of plugged tubes.

Simulate Clean Condenser U Values –This feature can be used to determine how much generation would be gained by cleaning the condenser based on provided data for clean condenser conditions.

Set U Values for Each Condenser Section – This allows you to manually input the heat transfer coefficient, U, for each condenser section.

Change Outside Air Conditions – Because both units are on cooling towers, changing outside air conditions will change the cold water temperature (circulating water inlet temperature). The current cooling tower performance is used as the basis to determine what the postulated cold water temperature would be based on the inputted outside air dry bulb and dew point temperature.

Print Report – Use this feature to print a summary report of the current conditions as well as the predictor case conditions.

Reset All Parameters to Current Conditions – This will reset all of the predictor case conditions back to their current value.

These features may be used in combination with one another to predict condenser and cooling tower performance for different operating conditions.

Sample Condenser Model:

See the attached sample condenser model main interface page. This sample includes a set of plant data with results as well as some predictor cases for the data.

Condenser Model

	Current Conditions		Design Values	
Data taken:	**8/14/06 8:28 AM**			
Core Thermal Power	**3451.81**	MWt		
Generation	**1181.42**	Mwe		
Circulating Water Inlet Temp	**83.67**	Deg F	**88.90**	Deg F
Circulating Water Outlet Temp	**119.42**	Deg F	**123.19**	Deg F
Circulating Water Flow	**434,022**	gpm	**451,380**	gpm
LP Section Backpressure	**2.39**	inHgA	**2.67**	inHgA
IP Section Backpressure	**3.13**	inHgA	**3.42**	inHgA
HP Section Backpressure	**4.19**	inHgA	**4.49**	inHgA
AVG. BP	**3.24**	inHgA	**3.53**	in HgA
LP Heat Transfer Coeff *	**623.49**	Btu/(hrft^2degF)	**576.15**	Btu/(hrft^2degF)
IP Heat Transfer Coeff *	**522.59**	Btu/(hrft^2degF)	**581.66**	Btu/(hrft^2degF)
HP Heat Transfer Coeff *	**518.57**	Btu/(hrft^2degF)	**585.75**	Btu/(hrft^2degF)
Tubes Plugged LP	**290**	-----		
Tubes Plugged IP	**127**	-----		
Tubes Plugged HP	**164**	-----		

Get New Data

Print Raw Data Only

Change Number of Plugged Tubes in Condenser

*Heat Transfer Coefficient baselined at 70F inlet water temperature.

Cooling Tower Performance

Ambient Temperature	**70.88**	Deg F
Dew Point	**61.92**	Deg F
Relative Humidity	**73.29%**	
Wet Bulb Temperature	**64.98**	Deg F
Range	**35.75**	Deg F
Predicted Circ. Water Inlet Temp	**80.58**	Deg F
Actual Circ. Water Inlet Temp.	**83.67**	Deg F
Actual Generation	**1181.42**	MWe
Predicted MWe (no CT degradation)	**1183.69**	MWe
MWe Diff due to CT Performance	**-2.27**	MWe

Results for Predictor Case

Change Circulating Water Inlet Temperature

Change Circulating Water Flow

Plug Condenser Tubes

Simulate Clean Condenser U Values

Set U Values for Each Condenser Section

Change Outside Air Conditions (changes CW Inlet Temp)

Print Report

Reset all parameters to current conditions

Circulating Water Inlet Temp	**80.00**	Deg F
Circulating Water Outlet Temp	**114.50**	Deg F
Circulating Water Flow	**450,000**	gpm
LP Section Backpressure	**2.14**	inHgA
IP Section Backpressure	**2.77**	inHgA
HP Section Backpressure	**3.69**	inHgA
Average BP	**2.87**	inHgA
LP Heat Transfer Coeff	**623.49**	Btu/(hrft^2degF)
IP Heat Transfer Coeff	**522.59**	Btu/(hrft^2degF)
HP Heat Transfer Coeff	**518.57**	Btu/(hrft^2degF)
Tubes Plugged LP	**290**	-----
Tubes Plugged IP	**127**	-----
Tubes Plugged HP	**164**	-----
Outside Air Dry Bulb	**70.88**	Deg F
Outside Air Dew Point	**61.92**	Deg F
Ouside Relative Humidity	**73.3%**	

Average Backpressure Change	**-0.37**	inHgA
Generation Difference	**3.2**	MWe

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