Power Analysis: Increasing Plant Efficiency and Reducing Operating Expenses by Utilizing:

PLANT AUTOMATION

case study

Desktop Study Performed by:
Inglett & Stubbs International, Ltd.
5 January 2015

Challenge

Inglett & Stubbs International (ISI) understands that power costs are a major expense for mining ventures and can consume a large percentage of an operational budget. The challenge is to uncover an option to significantly improve plant fuel efficiency with a minimal investment in infrastructure.

Solution

Power plant automation provides a minimal investment to reduce fuel consumption at the mine site. This solution utilizes the current site generation source and fuel type. Plant automation is geared towards installing load sensing components and meters on existing equipment in order to better understand plant demand. Using this information, automation controls optimize operating generators based on current and expected power demands in order to more efficiently meet load requirements while conserving valuable fuel.

Results

An analysis of 1088kW and 1600kW high speed diesel gensets under site conditions* show that an addition of plant automation controls can reduce fuel costs by up to 1%. With annual fuel expenses in the range of $27 - $29 million USD, potential savings can surpass $250,000 yearly with an approximate 2 year installation payback. Depending on the remaining life of the mine site, your return on investment from adding automation could range from $1 - $ 2 million.

	Typical Power Plant Diesel Generators	
	CAT 3512B (1088kWe)	CAT 3516B (1600kWe)
Annual Fuel Consumption (L)		
Prior to Automation	22,244,087.20	20,942,781.87
After Automation	22,113,311.94	20,737,951.34
Annual Fuel Savings	**130,775.26**	**204,830.52**
Annual Fuel Cost (USD)		
Prior to Automation	$28,917,313.36	$27,225,616.43
After Automation	$28,747,305.52	$26,959,336.75
Annual Fuel Savings	**$170,007.84**	**$266,279.68**
Payback Period (Years)	2.94	1.88
10 Year Return on Investment	**$1,030,070.54**	**$1,896,517.14**

*ISI's analysis was performed on a site with 12,000 kWe Peak Load, 10,000 kWe Average Load, and 6,000 kWe Maintenance Load. Load provided by either 13 - 1088 kWe CAT 3521B's or 9 - 1600 kWe CAT 3516B's. Diesel fuel is assumed at 840 grams/litre density at $1.30/litre USD cost. Generators are evaluated at ISO ratings. 10 year ROI assumes 1 year installation period prior to commissioning.

ISI can perform this desktop analysis for your specific site conditions and current generation equipment.

ISI will provide specific control and automation solutions to help reduce your fuel and power operating expenses at your site.

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SOLAR UPGRADES

case study

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Challenge

Can adding solar energy components to a mine power plant be an attractive option to reduce operational expenses? Perhaps, but prior to implementation, it is necessary to understand what is required to properly integrate solar at your site and the realistic payback of this technology.

Solution

Installation of a solar array into the existing power grid can help to reduce expenses at your mine site. How much savings depends on site factors such as current power technology and solar availability. It is important to note that this study and cost structure includes the necessary controls, sizing, and grid stabilization components for successful integration into the existing power systems. The addition of storage technology can help with stabilization and increases the effectiveness of the solar installation, but is not necessary to realize reduced fuel costs.

Results

An analysis of four different generator models under site conditions* show that an addition of a 1 megawatt solar array can reduce fuel costs by up to 2%. With annual fuel expenses in the range of $14 Million (HFO) to $29 Million (Diesel), potential savings can surpass $570,000 yearly with an installation payback in less than 5 years. With the declining solar costs in the market, predictive cost analysis shows that for an "ideal" installation date with payback in less than 4 years, now may be the time to begin looking at a solar solution. Addition of an energy storage solution increases savings by 80%, but also increases payback time by 60%.

	High Speed Diesel Generators		Medium Speed Generators	
	CAT 3512B (1088kWe)	CAT 3516B (1600kWe)	ABC 8DZC1000 (1680kWe Diesel)	ABC 8DZC750 (1327kWe HFO)
Annual Fuel Consumption (L)				
Prior to Solar Install	22,113,311.94	20,737,951.34	18,306,953.57	16,086,309.57
After Solar Install	21,674,294.43	20,326,238.99	17,943,504.03	15,766,946.67
Annual Fuel Savings	**439,017.51**	**411,712.36**	**363,449.54**	**319,362.91**
Annual Fuel Cost (USD)				
Prior to Solar Install	$28,747,305.52	$26,959,336.75	$23,799,039.64	$13,834,226.23
After Solar Install	$28,176,582.76	$26,424,110.69	$23,326,555.23	$13,559,574.13
Annual Fuel Savings	**$570,722.76**	**$535,226.06**	**$472,484.41**	**$274,652.10**
Payback Period (Years)	3.75	4	4.53	7.79
10 Year Return on Investment	**$2,996,294.50**	**$2,676,130.31**	**$2,112,005.30**	**$332,329.04**
Ideal Installation Date (For 4 Year Payback Period)	*Q3 - 2014*	*Q1 - 2015*	*Q3 - 2015*	*Q2 - 2017*

*ISI's analysis was performed on a site with 12,000 kWe Peak Load, 10,000 kWe Average Load, and 6,000 kWe Maintenance Load. Load provided by either 13 - 1088 kWe CAT 3521B's, 9 - 1600 kWe CAT 3516B's, 9 - 1680kWe ABC 8DZE1000 (DFO), or 11 - 1327kWe ABC 8DZC750 (HFO) gensets. Generators are evaluated at ISO ratings. Diesel fuel is assumed at $1.30/litre USD cost. HFO is assumed at $.86/ litre USD cost. Solar availability is assumed to be 1,600,000kWh at (24.0° S, 25.0° E). 10 year ROI assumes 1 year installation period prior to commissioning.