

case study

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



Challenge

Inglett & Stubbs International (ISI) understands that fuel costs are a large portion of operational expenses. Mine site power plants are typically comprised of high speed diesel generators, consuming large amounts of diesel fuel for plant operation. Our challenge is to provide an alternate power generation technology such that installation costs can be offset by fuel savings in a reasonable time span when compared to the mine life cycle.

Solution

Before replacing any power generation technology, ISI performs a full study on site loads, motor starting capacity, and long maximum load durations. This ensures the correct generator sizes and configurations are utilized during the design. The first of ISI's two technology replacement solutions focuses on replacing power generation technology while retaining the current site fuel source and fuel infrastructure.

Result 1

An analysis of existing high speed diesel gensets under site conditions* shows that equipment replacement with medium speed diesel alternatives will reduce fuel consumption by 12-18%. With annual high speed fuel costs ranging from \$27 - \$29 million USD, a medium speed diesel equipment alternative will cut from \$3 - \$5 million out of the annual yearly operational budget. The installation payback ranges between 2.6 - 4.4 years. Assuming 10 years remain on a mine life, total savings range from \$19 - \$38 million.

	Medium Speed Diesel Alternates	
	ABC 6DZC1000 (1260kWe)	ABC 8DZC1000 (1680kWe)
Annual Fuel Consumption (L)	18,127,557.14	18,306,953.57
Annual Fuel Cost (USD)	\$23,565,824.29	\$23,799,039.64
vs. CAT 3521B (1088kWe HS Diesel)		
Annual Fuel Savings (L)	3,985,754.79	3,806,358.37
Annual Fuel Savings (USD)	\$5,181,481.23	\$4,948,265.88
Payback Period (Years)	2.66	2.79
10 Year Return on Investment	\$32,872,331.09	\$30,704,992.88
vs. CAT 3516B (1600kWe HD Diesel)		
Annual Fuel Savings (L)	2,610,394.20	2,430,997.77
Annual Fuel Savings (USD)	\$3,393,512.46	\$3,393,512.46
Payback Period (Years)	4.06	4.38
10 Year Return on Investment	\$16,780,612.16	\$15,691,666.20

*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, 11 - ABC 6DZC1000's, 9 - ABC 8DZC1000's, or 5 - ABC 16DZC1000's. Diesel fuel is assumed at 840 grams/litre density at \$1.30/litre USD cost. 10 year ROI assumes 1 year installation period prior to commissioning.

Result 2 outlines the most significant operational expense reduction solution presented in this study. It can be found on the following page.



case study

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



Result 2

In addition to equipment change out from high speed to medium speed, it is recommended that fuel type also be reviewed. Changing from diesel to heavy fuel oil (HFO) means significant infrastructure, logistics, and process changes at a mine site. The initial expense to perform this type of upgrade can be substantial. However, when running site condition* comparisons of medium speed, HFO generators and their high speed diesel counterparts, the fuel savings are significant.

With a medium speed HFO solution, fuel usage can be reduced by 22-28%, vs. high speed diesel installations. This fuel reduction will result in an annual fuel savings of \$13 - \$15 million USD. With this type of savings, payback of the initial investment occurs in under 3 years. With a 10 year remaining mine life, savings reach well over \$100 million over the life of the installation.

Case Study Note

In addition to the fuel savings outlined by this case study, there are more benefits of switching to a medium speed technology and an HFO fuel solution. Medium speed HFO engines are traditionally quieter, more durable, and have longer overhaul periods and less downtime when compared to high speed diesels. Costs associated with increased reliability of medium speed HFO are not included in this study, but should be considered when looking at a fuel efficient upgrade.

	Medium Speed HFO Alternates	
	ABC 6DZC750 (995kWe)	ABC 8DZC750 (1327kWe)
Annual Fuel Consumption (L)	15,823,480.85	16,086,309.57
Annual Fuel Cost (USD)	\$13,608,193.53	\$13,834,226.23
vs. CAT 3521B (1088kWe HS Diesel)		
Annual Fuel Saving (L)	6,289,831.09	6,027,002.36
Annual Fuel Savings (USD)	\$15,139,111.99	\$14,913,079.28
Payback Period (Years)	1.31	1.28
10 Year Return on Investment	\$116,419,771.18	\$115,128,972.08
vs. CAT 3516B (1600kWe HD Diesel)		
Annual Fuel Savings (L)	4,914,470.49	4,651,641.77
Annual Fuel Savings (USD)	\$13,351,143.22	\$13,125,110.51
Payback Period (Years)	1.48	1.46
10 Year Return on Investment	\$100,400,596.99	\$98,963,333.28

*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, 11 - ABC 6DZC1000's, 9 - ABC 8DZC1000's, or 5 - ABC 16DZC1000's. Diesel fuel is assumed at 840 grams/litre density at \$1.30/litre USD cost. 10 year ROI assumes 1 year installation period prior to commissioning.

It is important to note that these results are based on site specific conditions that are not universal.

Contact ISI for a complete review of your site details, requirements, and see which options are best for your site.