



**STEEL SHIELD TECHNOLOGIES
(ASIA PACIFIC) LIMITED**

Shenzhen Dongjiang Environmental Company Limited

Qing Shui He Xia Ping Biogas Power Plant

Cost Efficient Analysis of Steel Shield Lubricants

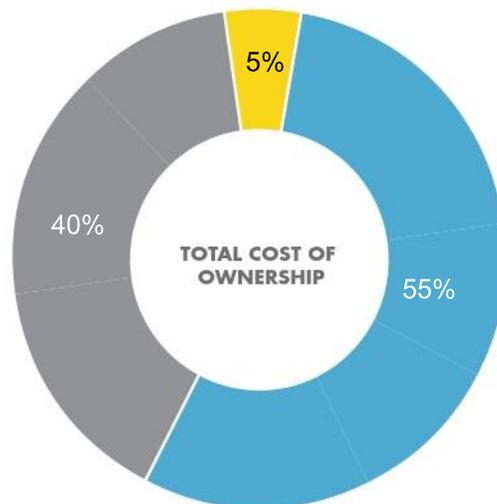
CONTENTS	Page
1. APPROACH 1 – GENERAL COST REDUCTIONS CALCULATION BY STEEL SHIELD LUBRICANTS.....	3
1.1. Lubricants: Low Cost, Big Impact.....	3
1.2. Where Lubricants Can Add Value.....	4
2. APPROACH 2 – COST ANALYSIS OF DONGJIANG POWER PLANT BY STEEL SHIELD.....	6
2.1. Basic Data of Qing Shui He Xia Ping Biogas Power Plant.....	6
2.2. Improved Data by Steel Shield Lubricants.....	7
2.3. Equations.....	8
2.4. Annual Cost Analysis.....	9
2.5. Power Plant Graphical Cost Analysis.....	11
3. CONCLUSION.....	13
4. CONTACT US.....	14



1. APPROACH 1 – GENERAL COST REDUCTIONS CALCULATION BY STEEL SHIELD LUBRICANTS

1.1. Lubricants: Low Cost, Big Impact

Buying low-quality lubricants can be a false economy. Lubricant costs are typically less than 5% of a power generation business' total maintenance budget. We focus on providing performance products that can help to reduce maintenance requirements and increase reliability, and services that are designed to improve maintenance and business practices, and thus lower your overall costs.



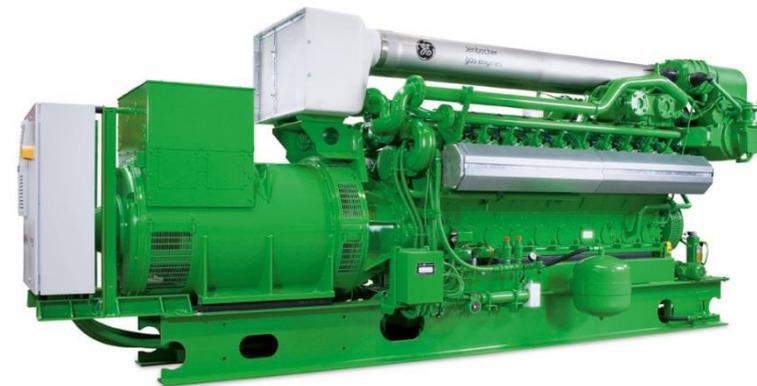
PRODUCT COSTS
Lubricants



MAINTENANCE COSTS
Leaks
Handling and dispensing
Oil analysis
Disposal

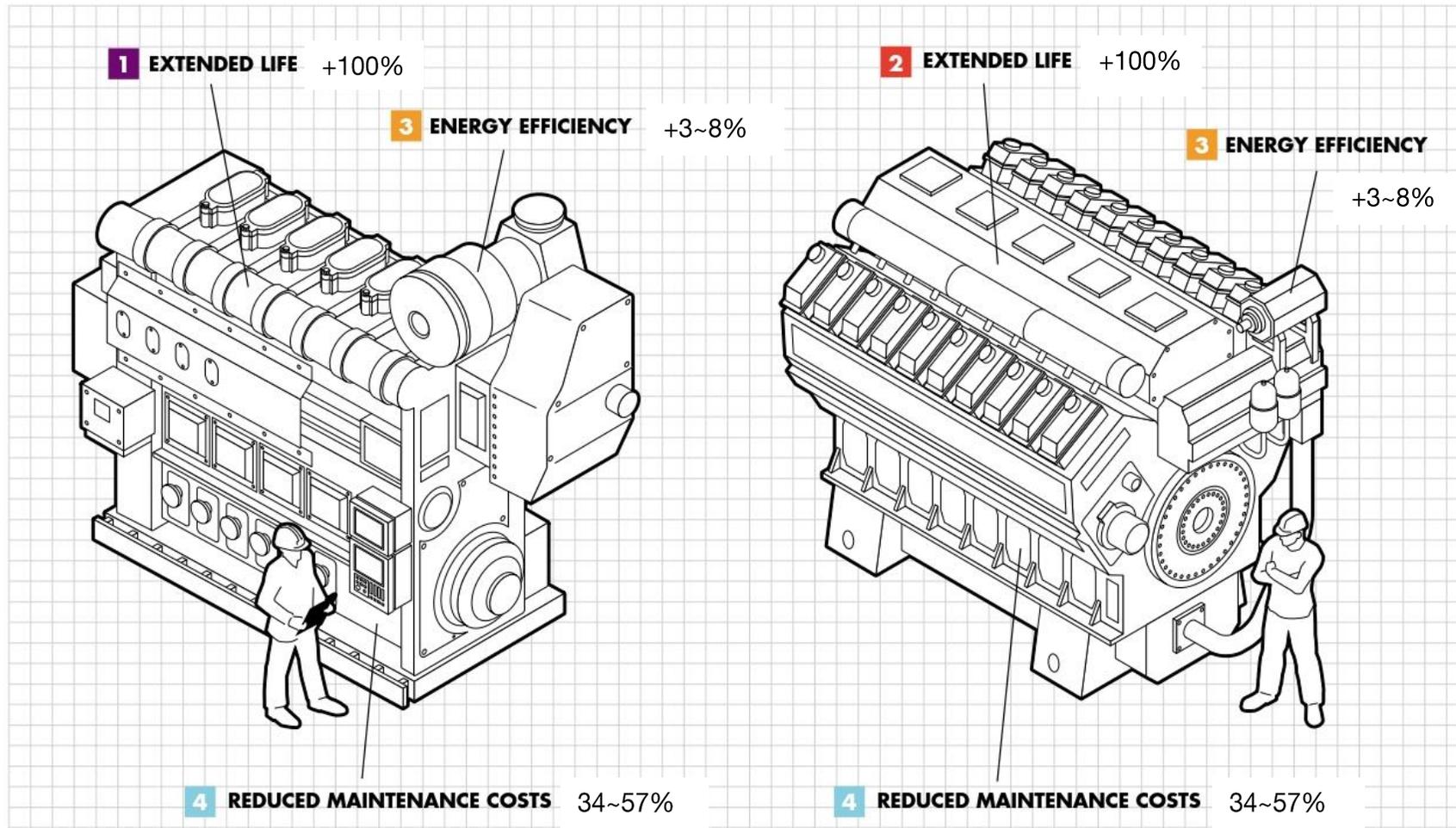


BUSINESS COSTS
Inventory
Administration and management
Training



1.2. Where Lubricants Can Add Value

Some examples of ways that lubricants can help your operation to run more efficiently:



- ✓ According to the Total Cost of Ownership of Power Plant Generators (previous page), **Lubricants Cost** is about **5%**, **Maintenance Cost** is about **55%**.
- ✓ From the information provided by The Shenzhen Dongjiang Environmental Company Limited, it reveals that the total volume to purchase **Caltex HDAX5500 LFG SAE40** lubricant is:
30 bottle x 200 liter x 12 times = 72,000 Litre
- ✓ The total cost to purchase **Caltex HDAX5500 LFG SAE40** lubricant (tax included) is:
25 RMB/Liter x 72,000 Liter = 1,800,000.00 RMB
- ✓ The **Total Cost of Ownership** can be calculated as (with 5% lubricant cost):
1,800,000.00 RMB ÷ 5% = 36,000,000.00 RMB
- ✓ The total annual maintenance cost of Dongjiang is:
36,000,000.00 RMB x 55% = 19,800,000.00 RMB
- ✓ With the applications of **Steel Shield** lubricants, the yearly **Maintenance Cost** of machines can be reduced by **34% to 57%**, which means:
6,732,000 RMB to 11,286,000.00 RMB
- ✓ The percentage reduction in **Total Cost of Ownership** by **Steel Shield** lubricants (%)
= (Total Maintenance Cost reduced + Lubricant Cost reduced) ÷ present Total Cost of Ownership x 100%
- ✓ ** Minimum = { 6,732,000 RMB + 1,440,580 (**Steel Shield No.3 Gas Engine Oil** vs **Caltex**) } ÷ 36,000,000 X 100% = 22.70%
- ✓ ** Maximum = { RMB 11,286,000 + 11,332,904 (**Steel Shield No.2 Gas Engine Oil** vs **Caltex**) } ÷ 36,000,000 X 100% = 62.83%



2. APPROACH 2 – COST ANALYSIS OF DONGJIANG POWER PLANT BY STEEL SHIELD

2.1. Basic Data of Qing Shui He Xia Ping Biogas Power Plant

Generator Data				
No.	Model	Quantity	Power (kW)	Total Power (kW)
M1	J320GSB 21 (GE Jenbacher)	1	1063	1063
M2	J320GSC 21 (GE Jenbacher)	8	1063	8504
M3	J320GSC 121 (GE Jenbacher)	3	1063	3189
M4	G3615 (Caterpillar)	2	800	1600
		Total	14	14356

The Present Operation Data				
Lubricant Consumption	6000	litre / month		
Lubricant Refill	1	times / month	12	times / year
Idle Time Before the Next MAJOR Maintenance	60000	hr		
Idle Time Before the Next Regular Maintenance	2000	to	4000	hr
Duration of Maintenance (Each Machine)	3	to	5	days
Downtime Cost (Each Machine)	18000	RMB / day		
Maintenance & Parts Cost (Entire Plant)	A	RMB / year		

2.1.1. EXPLANATIONS

1. Qing Shui He Xia Ping Biogas Power Plant have 4 types of generators with No. M1, M2, M3 and M4.
2. The routine used lubricants analysis is about 200 hours for the first time (for new lubricants), and then 500 hours for the second time.
3. The downtime cost includes the revenue lost due to the suspension of electricity generations.
4. MAJOR Maintenance is the full functional examinations of generators. It is not included in the current cost analysis (for reference only).
5. The variable “A” is a real number, it is used to make assumptions for Maintenance & Part Cost because this cost is not provided by the Qing Shui He Xia Ping Biogas Power Plant.

2.2. Improved Data by Steel Shield Lubricants

The Improved Maintenance Cost With the Application of Steel Shield				
Idle Time Before the Next Regular Maintenance (after refilled 2~5 times)	4000	to	6000	hr
Reduction in Lubricants Refills (%)	33	to	50	%
Lubricant Refill	8	to	6	times / year
Parts Life Extended 2 Times and More, Maintenance Reduction (%)	50	%		
Maintenance & Part Costs (Entire Power Plant)	0.5	A	RMB / year	

2.2.1. EXPLANATIONS

With Steel Shield lubricants, the following data can be improved:

1. The Idle Time Before the Next Regular Maintenance: after Steel Shield is refilled 2 to 5 times, it is expected that the idle time can be extended from 4000 to 6000 hours.
2. The Lubricant Refill times can be reduced from 8 to 6 times annually.
3. The Maintenance & Part Costs can be dramatically decreased to 0.5A (only 50% of the original cost) annually (where A is a real number) due to the extended components life by ABF Technology of Steel Shield lubricants.

Other possible cost reductions by the application of Steel Shield but not included in the current calculation:

1. Labor cost reduction: due to the reduction of unnecessary maintenance, reductions in overtime payments and reduction in employing temporary staffs



2.3. Equations

EQUATIONS	
1	<p>$Total\ Lubricant\ Cost = Lubricant\ Cost\ (RMB\ /Litre) \times Lubricant\ Consumption\ (Liter\ /Month) \times Lubricant\ Renew\ (Times\ /Year)$</p> <p>Assume that the power plant refill Caltex once per month. With the application of Steel Shield, the refill time can be extended to 45 to 60 days, i.e. 8 to 6 times per year. The minimum and maximum cost of Caltex are both based on the fact that the lubricants are being refilled 12 time per year. The minimum and maximum cost of Steel Shield lubricant are based on the fact that the lubricants are being refilled 6 times and 8 times per year respectively.</p>
2	<p>$Power\ Generator\ Maintenance\ Cost = \frac{Duration\ Per\ Maintenance\ (day) \times Downtime\ Cost\ (RMB) \times 365\ days \times 24\ hr}{Idle\ Time\ for\ the\ Next\ Regular\ Maintenance\ (hr)}$</p> <p>Example: To calculate the Minimum Maintenance Cost of Caltex, the maximum Idle Time for the Next Regular Maintenance (i.e. 4000 hr) and the minimum Duration Per Maintenance (i.e. 3 days) must be used. Alternatively, the Maximum Maintenance Cost of Caltex is calculated by the minimum Idle Time for the Next Regular Maintenance (i.e. 2000 hr) and the maximum Duration Per Maintenance (i.e. 35 days). The same method is applied when the Caltex is replaced by Steel Shield.</p>
3	<p>$TOTAL\ COST\ (Minimum) = Total\ Lubricant\ Cost\ (Minimum) + Total\ Maintenance\ Cost\ (Minimum) + Maintenance\ \&\ Parts\ Costs$</p> <p>$TOTAL\ COST\ (Maximum) = Total\ Lubricant\ Cost\ (Maximum) + Total\ Maintenance\ Cost\ (Maximum) + Maintenance\ \&\ Parts\ Costs$</p>
4	<p>Assumption of the present Maintenance & Part Costs: Due to the absent of real data, the Maintenance & Part Costs is assumed to be 0 to 1,000,000 per year, and the analysis is performed by using these range of data discretely.</p> <p>Assumption of the present Maintenance & Part Costs When Steel Shield is applied: Normally, with the applications of Steel Shield, maintenance cost can be reduced by 30~65%. The minimum and maximum TOTAL COST are based on these assumptions, therefore, the change of TOTAL COST can be revealed when the Maintenance & Part Costs changes from 0 to 1,000,000 RMB.</p>
5	<p>$TOTAL\ COST\ Reduction\ (Minimum),\ \% = \frac{TOTAL\ COST\ After\ Steel\ Shield\ Applied\ (Maximum) - TOTAL\ COST\ When\ Caltex\ Applied\ (Minimum)}{TOTAL\ COST\ When\ Caltex\ Applied\ (Minimum)} \times 100\%$</p> <p>$TOTAL\ COST\ Reduction\ (Maximum),\ \% = \frac{TOTAL\ COST\ After\ Steel\ Shield\ Applied\ (Minimum) - TOTAL\ COST\ When\ Caltex\ Applied\ (Maximum)}{TOTAL\ COST\ When\ Caltex\ Applied\ (Maximum)} \times 100\%$</p> <p>From the above equations, the minimum and maximum reductions of TOTAL COST after Steel Shield is applied can be calculated respectively (in %).</p>

2.4. Annual Cost Analysis

		ANNUAL COST ANALYSIS (RMB/YEAR)										
		The Present Situation		With the Application of Steel Shield with ABF Technologies								
		Caltech HDAX500 LFG SAE40		SST BCI GBCAT No.1 HD-AP Gas Engine Oil SAE 30/40 0.5% Ash		SST BCI GBCAT No.2 LD-TV Gas Engine Oils SAE 30/40 0.5% Ash		SST BCI GBCAT No.3 HD-AP / ST Gas Engine Oils SAE 40 0.7% Ash		SST BCI GBCAT No.5 ND-AP MA-S3 Gas Engine Oils SAE 40 0.7% Ash		
Lubricant Costs, Tax Not Included (RMB / litre)		21.75		27.47		21.01		30.48		21.57		
		Each Generator	All Generators	Each Generator	All Generators	Each Generator	All Generators	Each Generator	All Generators	Each Generator	All Generators	
	Lubricant Cost (Minimum)	1,566,000	21,924,000	988,934	13,845,082	756,507	10,591,096	1,097,326	15,362,565	776,621	10,872,691	
	Lubricant Cost (Maximum)	1,566,000	21,924,000	1,318,579	18,460,109	1,008,676	14,121,462	1,463,101	20,483,420	1,035,494	14,496,922	
	Maintenance Cost (Minimum)	118,260	1,655,640	78,840	1,103,760	78,840	1,103,760	78,840	1,103,760	78,840	1,103,760	
	Maintenance Cost (Maximum)	394,200	5,518,800	197,100	2,759,400	197,100	2,759,400	197,100	2,759,400	197,100	2,759,400	
	Maintenance & Parts Costs	A / 14	A	0.5 A / 14	0.5 A	0.5 A / 14	0.5 A	0.5 A / 14	0.5 A	0.5 A / 14	0.5 A	
TOTAL COST (Minimum) Equation		1684260 + A / 14	23579640 + A	1067775 + 0.5 A / 14	14948842 + 0.5 A	835347 + 0.5 A / 14	11694857 + 0.5 A	1176167 + 0.5 A / 14	16466326 + 0.5 A	855461 + 0.5 A / 14	11976452 + 0.5 A	
TOTAL COST (Maximum) Equation		1960200 + A / 14	27442800 + A	1515680 + 0.5 A / 14	21219509 + 0.5 A	1205776 + 0.5 A / 14	16880862 + 0.5 A	1660202 + 0.5 A / 14	23242821 + 0.5 A	1232595 + 0.5 A / 14	17256322 + 0.5 A	
	Assumption of the present Maintenance & Part Costs (RMB / yr)	Assumption of the present Maintenance & Part Costs When Steel Shield is applied, 0.5A (RMB / yr)										
TOTAL COST (Minimum)	0	0	1,684,260	23,579,640	1,067,774	14,948,842	835,347	11,694,856	1,176,166	16,466,325	855,461	11,976,451
	100,000	50,000	1,691,403	23,679,640	1,071,346	14,998,842	838,918	11,744,856	1,179,738	16,516,325	859,032	12,026,451
	200,000	100,000	1,698,546	23,779,640	1,074,917	15,048,842	842,490	11,794,856	1,183,309	16,566,325	862,604	12,076,451
	300,000	150,000	1,705,689	23,879,640	1,078,489	15,098,842	846,061	11,844,856	1,186,880	16,616,325	866,175	12,126,451
	400,000	200,000	1,712,831	23,979,640	1,082,060	15,148,842	849,633	11,894,856	1,190,452	16,666,325	869,747	12,176,451
	500,000	250,000	1,719,974	24,079,640	1,085,632	15,198,842	853,204	11,944,856	1,194,023	16,716,325	873,318	12,226,451
	600,000	300,000	1,727,117	24,179,640	1,089,203	15,248,842	856,775	11,994,856	1,197,595	16,766,325	876,889	12,276,451
	700,000	350,000	1,734,260	24,279,640	1,092,774	15,298,842	860,347	12,044,856	1,201,166	16,816,325	880,461	12,326,451
	800,000	400,000	1,741,403	24,379,640	1,096,346	15,348,842	863,918	12,094,856	1,204,738	16,866,325	884,032	12,376,451
	900,000	450,000	1,748,546	24,479,640	1,099,917	15,398,842	867,490	12,144,856	1,208,309	16,916,325	887,604	12,426,451
1,000,000	500,000	1,755,689	24,579,640	1,103,489	15,448,842	871,061	12,194,856	1,211,880	16,966,325	891,175	12,476,451	
TOTAL COST (Maximum)	0	0	1,960,200	27,442,800	1,515,679	21,219,509	1,205,776	16,880,862	1,660,201	23,242,820	1,232,594	17,256,322
	100,000	50,000	1,967,343	27,542,800	1,519,251	21,269,509	1,209,347	16,930,862	1,663,773	23,292,820	1,236,166	17,306,322
	200,000	100,000	1,974,486	27,642,800	1,522,822	21,319,509	1,212,919	16,980,862	1,667,344	23,342,820	1,239,737	17,356,322
	300,000	150,000	1,981,629	27,742,800	1,526,393	21,369,509	1,216,490	17,030,862	1,670,916	23,392,820	1,243,309	17,406,322
	400,000	200,000	1,988,771	27,842,800	1,529,965	21,419,509	1,220,062	17,080,862	1,674,487	23,442,820	1,246,880	17,456,322
	500,000	250,000	1,995,914	27,942,800	1,533,536	21,469,509	1,223,633	17,130,862	1,678,059	23,492,820	1,250,452	17,506,322
	600,000	300,000	2,003,057	28,042,800	1,537,108	21,519,509	1,227,204	17,180,862	1,681,630	23,542,820	1,254,023	17,556,322
	700,000	350,000	2,010,200	28,142,800	1,540,679	21,569,509	1,230,776	17,230,862	1,685,201	23,592,820	1,257,594	17,606,322
	800,000	400,000	2,017,343	28,242,800	1,544,251	21,619,509	1,234,347	17,280,862	1,688,773	23,642,820	1,261,166	17,656,322
	900,000	450,000	2,024,486	28,342,800	1,547,822	21,669,509	1,237,919	17,330,862	1,692,344	23,692,820	1,264,737	17,706,322
1,000,000	500,000	2,031,629	28,442,800	1,551,393	21,719,509	1,241,490	17,380,862	1,695,916	23,742,820	1,268,309	17,756,322	
TOTAL COST Reduction (Minimum), %	0	0			10		28		1		27	
	100,000	50,000			10		29		2		27	
	200,000	100,000			10		29		2		27	
	300,000	150,000			11		29		2		27	
	400,000	200,000			11		29		2		27	
	500,000	250,000			11		29		2		27	
	600,000	300,000			11		29		3		27	
	700,000	350,000			11		29		3		27	
	800,000	400,000			11		29		3		28	
	900,000	450,000			11		29		3		28	
1,000,000	500,000			12		29		3		28		
TOTAL COST Reduction (Maximum), %	0	0			46		57		40		56	
	100,000	50,000			46		57		40		56	
	200,000	100,000			46		57		40		56	
	300,000	150,000			46		57		40		56	
	400,000	200,000			46		57		40		56	
	500,000	250,000			46		57		40		56	
	600,000	300,000			46		57		40		56	
	700,000	350,000			46		57		40		56	
	800,000	400,000			46		57		40		56	
	900,000	450,000			46		57		40		56	
1,000,000	500,000			46		57		40		56		

2.4.1. EXPLANATIONS

- Under the column “Assumption of the present Maintenance & Part Costs, A (RMB / yr)”, A is the assumed annual cost.
For example, if the assumed annual cost is 200,000 RMB, then the annual TOTAL COST (minimum) of **Caltex HDAX5500 LFG SAE40** is 23,779,640 RMB and the corresponding maximum TOTAL COST is 27,642,800 RMB.
- For Steel Shield lubricants, it is expected that the Assumption of the present Maintenance & Part Costs can be reduced by half. Therefore, the “Assumption of the present Maintenance & Part Costs **When Steel Shield is applied**, 0.5A (RMB / yr)” is **A/2**.
For example, if the assumed annual cost is 200,000 RMB, then this cost is reduced by half which is only 100,000 RMB. The annual TOTAL COST (minimum) of **SST ECI GECAT No.1 HD-AP Gas Engine Oil SAE 30/40 0.5% Ash** is then 15,048,842 RMB and the corresponding maximum TOTAL COST is 21,319,509 RMB.
- “The TOTAL COST Reduction (Minimum), %” and “The TOTAL COST Reduction (Maximum), %” columns are the expected percentage changes when Steel Shield is applied.
For example, in order to calculate “The TOTAL COST Reduction (Maximum), %” of **SST ECI GECAT No.1 HD-AP Gas Engine Oil SAE 30/40 0.5% Ash** if the “Assumption of the present Maintenance & Part Costs”, A is 1,000,000, the “TOTAL COST (Minimum)” of **SST ECI GECAT No.1 HD-AP Gas Engine Oil SAE 30/40 0.5% Ash** and the “TOTAL COST (Maximum)” of **Caltex HDAX5500 LFG SAE40** should be used in the calculation.

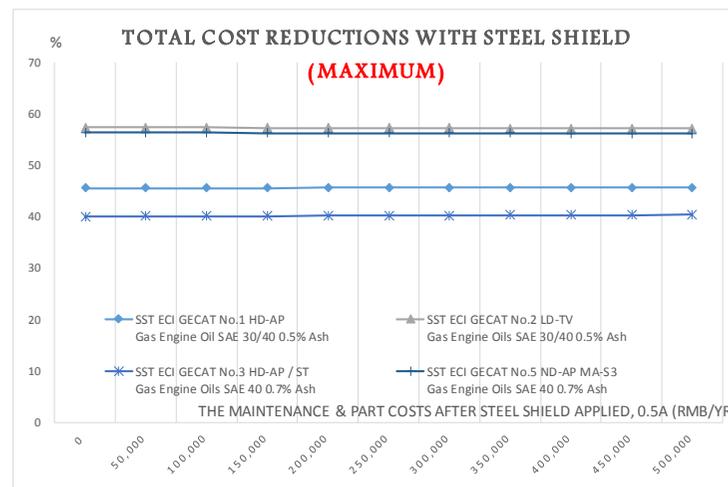
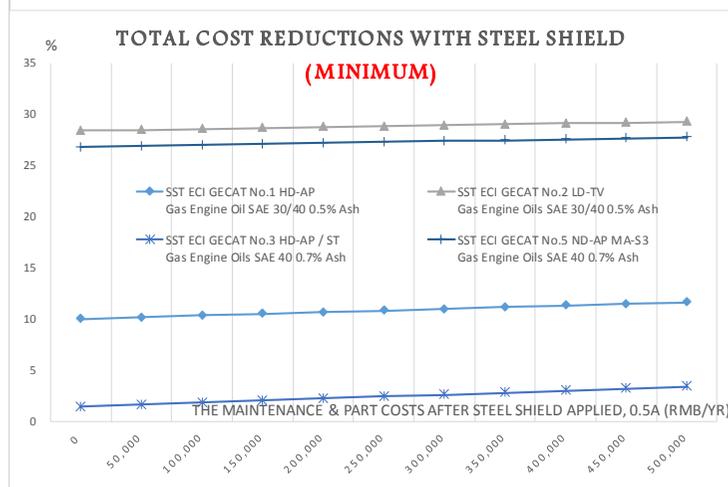
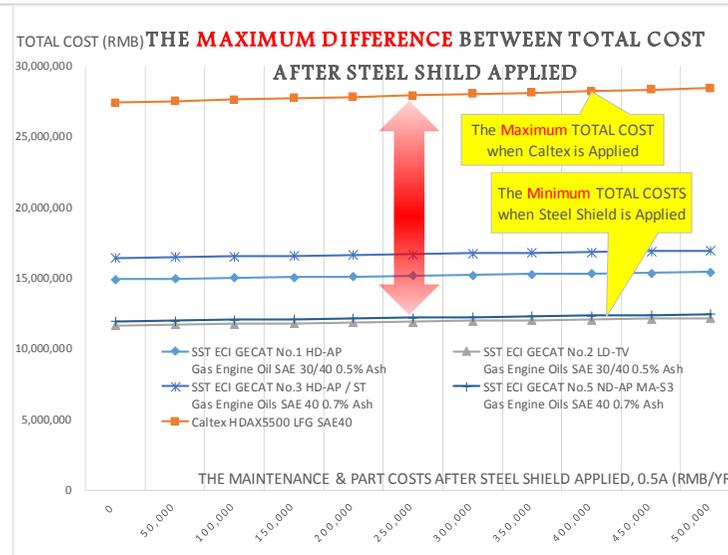
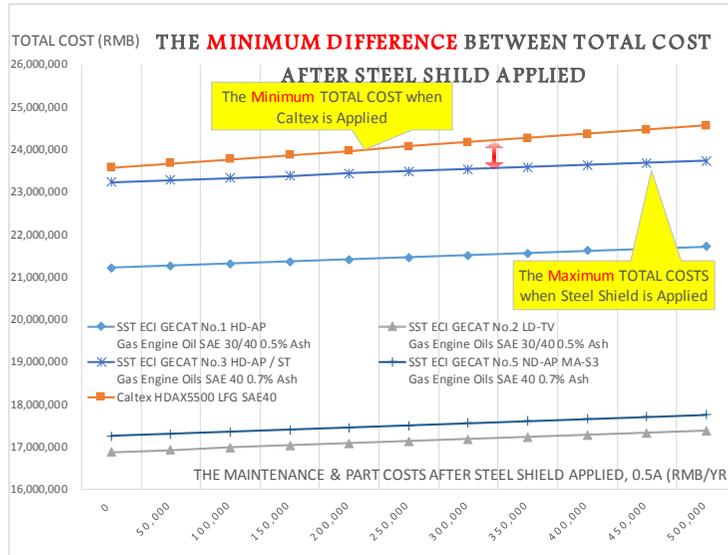
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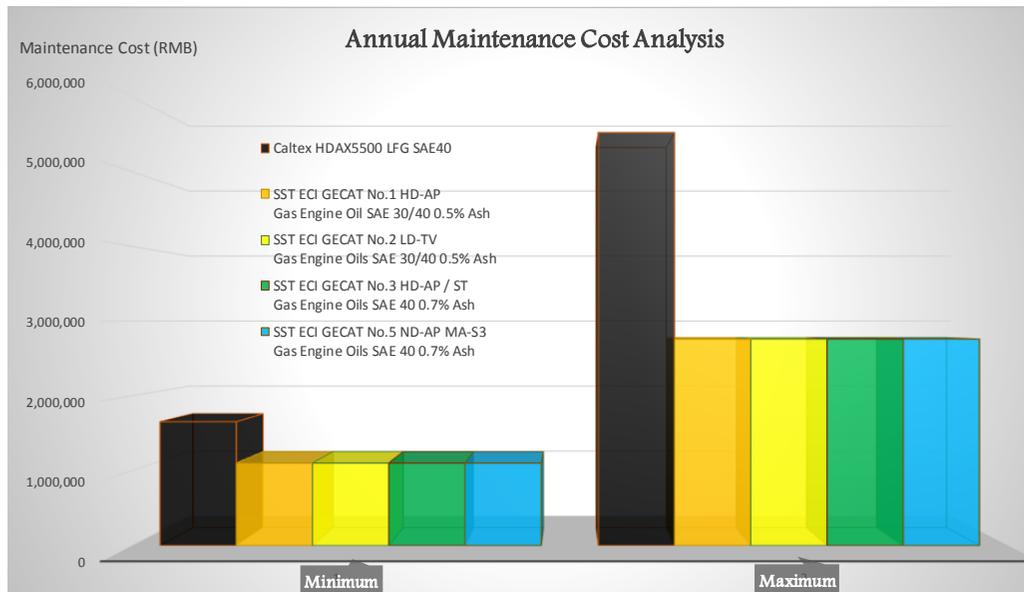
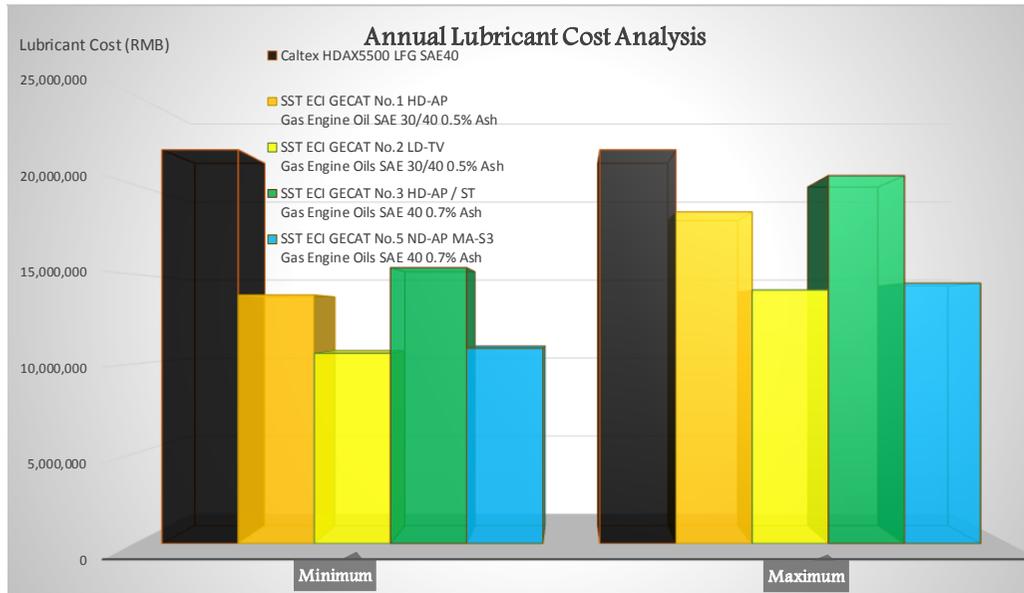
The TOTAL COST Reduction (Maximum), %

$$\begin{aligned}
 &= \frac{(\text{Min. TOTAL COST of SST ECI GECAT No. 1 HD – AP Gas Engine Oil SAE 30/40 0.5% Ash}) - (\text{Max. TOTAL COST of Caltex HDAX5500 LFG SAE40})}{\text{Max. TOTAL COST of Caltex HDAX5500 LFG SAE40}} \times 100\% \\
 &= \frac{12,194,856 - 28,442,800}{28,442,800} \times 100\% \\
 &= 57\% \text{ Reduction}
 \end{aligned}$$



2.5. Power Plant Graphical Cost Analysis





3. CONCLUSION

Applying Steel Shield lubricants:

1. The annual Lubricant Cost with Steel Shield can be reduced by **10.6 million RMB, which is a substantial savings of 51.7%**.
2. The annual Maintenance Cost can be as low as **1.2 million RMB, which is 80% of the original**.
3. With the “Assumption of the present Maintenance & Part Costs”, the **minimum TOTAL COST can be reduced to 11.7 million RMB, which is a COST SAVINGS of 59%**.
4. **STEEL SHIELD comparing to the other make of lubricants can help reducing** projected maintenance costs dramatically.



4. CONTACT US



STEEL SHIELD TECHNOLOGIES (ASIA PACIFIC) LIMITED

Address: Unit K, 11/F, Leader Industrial Centre, Phase 2,
188-202 Texaco Road, Tsuen Wan, HK

Tel.: +852 2545 8029

Fax: +852 2545 8030

Facebook : www.facebook.com/steelshieldtech

Weibo: <http://www.weibo.com/steelshield>

