附件建國科技大學機械工程系暨製造科技研究所

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(1)文章標題之翻譯。

A case study on thrust bearing failures at the SÃO SIMÃO hydroelectric power plant

聖西芒水力電廠推力軸承的故障案例分析

(2)摘要內容翻譯。

After twenty years without any apparent problems on their combined guide and thrust bearings, the six 280 MW hydrogenerators of the São Simão Hydroelectric Power Plant were failing. The source of the failure was the melting of the thrust pad babbitt lining. The machines began showing performance failures, leading to a sudden interruption in their operation. This caused considerable losses with high direct and indirect costs. The solution proposed by the bearing manufacturer was an improvement in the bearing design and the installation of new water – oil heat exchangers. The direct cost of their solution was estimated to be US $2,400,000.00. In a search for a less expensive alternative, CEMIG started a parallel study focused on the heat exchangers. A methodology based on heat transfer was applied, indicating that an increase in the heat exchange surface area could solve the problem. A third heat exchanger was added in one machine that already possessed two. The results fulfilled the preliminary predictions, eliminating the risk of additional babbitt lining failures. As a consequence of this success modeling, heat exchangers were replaced by stainless steel plate ones in all machines. This alternative solution had a total direct cost of US $600,000.00.

經過二十多年來，沒有針對水力發電的聯合式引導軸承和推力軸承發現任何明顯的問題，六個可產生 280 兆瓦的水輪發電機聖保羅西芒水力發電廠均故障。故障的原因是止推襯墊(巴氏合金)的熔化。機器開始出現性能故障，導致突然性中斷他們的營運。導致相當大的的直接的和間接的成本損失。承包的軸承製造商的解決方案是在軸承的原設

計上添加新的油水混和式熱交換器安裝來做改善。他們的解決方案的直接成本估計預算要 2,400,000.00 美元。所以須尋找一個更便宜的選擇，鋼鐵工業(CEMIG)公司開始了類似的研究主要集中在熱交換器。基於熱力學裡熱傳的應用，顯示出增加熱交換面積可以解決這個問題。所以利用第三台熱交換器附加在原本的兩台交換器上。得到了初步的假設，除了消除額外的巴氏合金襯墊熔化的風險。並經研究得到了證實，並由鋼鐵工業(CEMIG)公司的人來負責熱交換器全面性的機器更換。這種替代的解決方案的預算只要 600,000.00 美元的成本。

(3) 相關單字提示與說明(至少 10 個字)。

hydroelectric power 水力發電

bearing

1. 關係，關聯

2. （機器的）軸承

3. 方面

failures

1. 失敗

2. 衰退；故障

performance

1. 成績，成果；工作

2. （機器等的）性能；(人的）技能，本事

operation

1. 操作；運轉

2. 作用；效力

considerable

1. 相當大的；相當多的

2. 值得考慮的；重要的

indirect

1. 遲緩的

2. 費力的

3. 間接的

solution

4. 解答；解決

5. 溶解，溶化；溶解狀態

heat exchangers 熱傳導

transfer

1. 轉換；調動

2. 搬遷，轉移；調任

preliminary 預備的；初步的

(4)至少三句之句型分析

The source of the failure was the melting of the thrust pad babbitt lining.

主詞 + 聯綴動詞 + 主詞補語

The machines began showing performance failures, leading to a sudden interruption in their operation.

主詞 + 動詞 + 直接受詞 + 介詞 + 間接介詞

The direct cost of their solution was estimated to be US $2,400,000.00.

主詞 + 動詞 + 副詞