

## DETAILS OF INTERESTING CLAIM

(From Failure of Large Oil Cooled Transformers - IMIA Paper 16-66(96)E)

No: DOIC35 (LPM)

Type of Insurance:

LP(M)

Description of damaged item:

The damage of the gas turbine generator

Cause of Loss:

(4) Other internal causes

Claim Cost

22 US\$ Mio

Description of Incident and Loss Prevention Measures initiated:

The loss involved a combined cycle gas turbine power plant, having one 166 MW gas turbine and one 63 MV steam turbine, each with their own alternators and generator transformers. The gas turbine generator transformer stepped up the voltage from 15.75 kV to 132 kV and was rated at 180 MVA. The cooling arrangements consisted of oil circulating pumps and air-cooling fans under thermostatic control. On start up, the pumps and fans were stationary until the thermostat detected a temperature rise in the oil at which the pumps and fans began to operate.

However, the oil temperature detector was not sited at the hottest location during start up, with the result that the upper halves of the windings started to overheat until the oil pumps and air fans began to operate.

After 26 months of commercial service in this fashion, one of the transformer's phases suffered a short circuit in its low voltage windings, and the transformer tripped out of service. The damage to the windings due to overheating became evident on examination. It was decided to enhance the cooling system by doubling the capacity of the air fans and oil circulating pumps, which were to commence operation from the first instant of start-up under an amended control sequence. A new transformer, up-rated to 220 MVA, was ordered accordingly with a scheduled delivery in eight months' time. Meanwhile emergency temporary repairs were carried out on the failed transformer as a matter of urgency, since the power station's entire generation was lost whilst the transformer was out of service. Six weeks later the transformer was returned to service at a reduced load pending the arrival of the new up-rated transformer.

After a further three months' service the transformer failed again, with extensive damage to all windings and ancillaries necessitating a complete rebuild. Following investigation, it was suspected that an internal contact had not been adequately secured during the temporary repair three months previously, leading to gradual overheating and eventual short circuit fault.

The transformer on order was urgently expedited and the delivery period was reduced from eight months to six months. Even so, the power station again lost all generation for a further two months.

Whilst the US \$0.993 million physical damage loss was not remarkable for this size of transformer, the power station had lost all generation for an aggregate period of 3 1/2 months, with a partial loss of generation for 3 months. The BI loss amounted to US \$21.339 million. In the light of this experience, the power station now has two additional transformers on site as

spares for the gas turbine and steam turbine generator transformers

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## **CODES**

### **1. Type of Insurance**

M - Machinery Breakdown

BE - Boiler Explosion

LP (M) M - Loss of Profits

ALOP (DSU) - Advance Loss of Profits

EAR - Erection All Risks

CAR - Contractors All Risks (Civil)

G - Guarantee

EE - Electronic Equipment

O - Other Classes

### **2. Cause of Loss**

(1) Faulty operation

(2) Faulty material or workmanship

(3) Faulty design

(4) Other internal causes

(5) Fire

(6) Explosion

(7) Storm

(8) Earthquake

(9) Other external causes

(10) Other causes or unknown