DETAILS OF INTERESTING CLAIM

No:

Type of Insurance:

EAR/ALOP

Description of damaged item:

Heavy duty gas turbine for generation of electricity

Cause of Loss:

(use code)

(2) – Faulty material

Claim Cost (100%)

(Net of deductible or time excess)

US$ 33.000.000

Description of Incident and Loss Prevention measures initiated:

A modern state of the art heavy duty gas turbine built by a well known manufacturer was damaged shortly after completing the trial run operation of the gas firing systems. This specific gas turbine was designed to run mainly on natural gas, but - as lots of other modern state of the art turbines - it was also able to run on oil. Before commissioning of the gas operation mode the turbine had produced electricity already for more than one year on oil, due to unavailability of gas. The damage concerned the unexpected failure of the blades of rotating row No. 3, a set of blades which never had caused any problems before on any comparable unit. Considerable blade damage upstream and total blade damage downstream was experienced.

In-depth investigations of the failure revealed that thermo mechanical fatigue caused the failure of these blades. The thermo-mechanical fatigue mechanism was induced by a water flushing procedure of the burners of the gas turbine when running on oil. The oil available at site was more dense than comparable oils used in other similar gas turbines of this type. As a result thereof the flushing procedure of the burners, which took place after each shut down in order to prevent coking of the remaining oil within the burners, had to be modified in such a way, that the amount of flushing water was increased in order to guarantee the complete flush out of residuals of the oil. In other words, with each shut down, 790 litres of cold water were sprayed into the turbine, at a moment when the turbine was still at its full operating temperature.

Through the injection of the considerable amount of water all parts along the hot gas path of the turbine showed sudden variations of the temperature following a very steep gradient, which precisely caused the thermo mechanical fatigue. Blade rows 1 and 2 resisted this temperature changes as they were designed and manufactured of directed solidified monocristallin material, resisting these steep temperature gradients. However, rotating blade row No 3 was manufactured of a conventional blade material, which is generally used for blades of gas turbines not exposed to such high temperatures and steep temperature gradients. All damaged blades of row 3 cracked at a height of 130 mm from its base.

The turbine had to be opened up completely and all of the rotating and stationary blades had to be exchanged. The repair period lasted more than four months.

As a remedial action to prevent reoccurrence of this loss the manufacturer considerably reduced the amount of flushing water by automatically draining the oil in the feed pipes to burners before initiating the flushing procedure.

Outline the interesting or unusual aspects of this claim or problems experienced during settlement:

All damaged blades of row No. 3 cracked in a uniform failure pattern. The investigation conducted revealed clearly from marks on the cracked surfaces, that these cracks started to develop already at an earlier satge and propagated over at least 8000 operating hours until finally breaking completely.

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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