hidden trouble. And it would affect the score of vibration characteristic.

On oct.25 2009, high vibration and then recovering of No.1 and No.2 bearing occurred. And on Nov.13 2009, similar event occurred. The root cause of first event is: During unit hot start, the steam temperature did not match the turbine casing temperature. The reheat steam temperature was less than IP casing metal temperature. The main steam temperature dropped greatly caused the turbine casing and rotor was cooled. It led to turbine casing and flange metal stress varied. The hot impulsion caused the turbine high vibration. The root cause of the second event is: During unit operation with load, the temperature of main steams and reheat steam dropped fast, and the IP and HP casing metal was cooled. The instant contracted rotor caused the turbine high vibration. The variety of vibration is only a phenomenon of the root cause. The impact will be mentioned in casing temperature difference and thermal deformation characteristic.

c) Casing temperature difference and thermal deformation characteristics

On oct.25 2009 and Nov.13 2009, during unit operation with load, the temperature of main steams and reheat steam dropped fast, and the IP and HP casing metal was cooled. The instant contracted rotor caused the turbine high vibration of No.1 and No.2 bearing.

B. Evaluation of turbine economic

The initial performance test in 2000 and performance test report after overhaul in 2006 are listed in Table III.

TABLE III THE INITIAL PERFORMANCE TEST IN 2000 AND PERFORMANCE TEST REPORT AFTER OVERHAUL IN 2006.

Year	Item		TMCR 370MW	75%	50%
2000.12	Turbine test heat consumption rate	kJ/(kW.h)	7729.22	7844.88	8011.33
	Turbine test heat consumption rate corrected	kJ/(kW.h)	7705.31	7823.82	7978.42
2007.04	Turbine test heat consumption rate	kJ/(kW.h)	7820.4	7939.2	8138.2
	Turbine test heat consumption rate corrected	kJ/(kW.h)	7724.5	7888.4	8078.7
Rate of change of turbine heat rate corrected		%	0.25	0.83	1.26

Compared with the performance test results in 2000 and 2007, under TMCR (370MW), 75% load and 50% load, turbine test heat consumption rate increases 0.25%, 0.83% and 1.26% respectively. And average value increases 0.78%. This is the normal heat rate transform.

But the reheat steam temperature deviation from the design value is too large. Under TMCR, 75% load and 50% load, the reheat steam temperatures are 518.4°C, 511.2°C and 501.0°C respectively, which are 21.6°C, 28.8°C, 39°C lower than the design value of 540°C. These are negative for safety and economy. If the reheat steam temperature can reach the design value, the turbine heat consumption rate will reduce about 0.55%. The transform of turbine performance is in the normal range.

IV. CONCLUSION

The weighting of corresponding factor is listed in the table IV. The reference listing of risk result and advice is shown in table V.

TABLE IV THE STANDARD OF RISK.

Risk result	Risk grade	Advice
R≤0.2	low	Consider delaying the overhaul cycle actively
0.2<R≤0.35	mid	Follow the now overhaul cycle, to delay the overhaul reasonably
0.35<R≤0.5	high	Follow the now overhaul cycle, to shorten the overhaul reasonably
R≥0.5	very high	Consider shortening the overhaul cycle actively

In accordance with comprehensive assessment solution of turbine operation condition, collected document, and related standard, integrated assessment score of each subsystem, the following conclusions are obtained: Till the end of the year 2011, comprehensive condition score of the turbine is 0.249. Compared to risk rating table, the risk level of turbine is II. Its risk is medium, thus we recommend that it is feasible to prolong the overhaul cycle shortly and appropriately.

TABLE V THE SCORE OF THE TURBINE

Failure probability	Design, manufactory, installation, commission factor	Operation, maintenance factor	Management factor	Risk result	Integrative result
0.148	1	1.95	1.15	0.235	0.249

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