Case History	Abnormal Vibration of Gear Reducer	General machine
Forced		

Object Machine

Gear reducer for motor driven fan

Observed Phenomena

A monitoring accelerometer mounted on the gear reducer indicated an alarm level vibration value.

Cause Presumed

It was estimated that the problem was specific to this gear (tooth contact, pitch error, tooth damage, etc.) as the models of the same type experienced no such problem.

Analysis and Data Processing

Time history analysis, frequency analysis and envelope analysis of the measured vibration data were performed as follows:

- Time history analysis—Striking phenomenon → Separation of tooth surface
- Frequency analysis—Major component being due to tooth meshing on the second stage → Second stage gear
- Envelope analysis—Rotational component of gear intermediate shaft → Second stage gear on the intermediate shaft side

In addition, a hammering test confirmed no resonance.

Then, as a result of observation of the tooth surface, a slight indentation was detected.

Countermeasures and Results

After replacing the gear intermediate shaft, adjustment was made of the input gear contact, and thus vibration ceased.
Checking by the gear manufacture of the gear on the intermediate shaft side second stage proved that the pitch error was more than the reference value.

Lesson Learned

Analysis based on the basics may clarify the defects identified to significant degree.

References

Nothing in particular

Keyword

Pitch error, envelope analysis, AM modulation

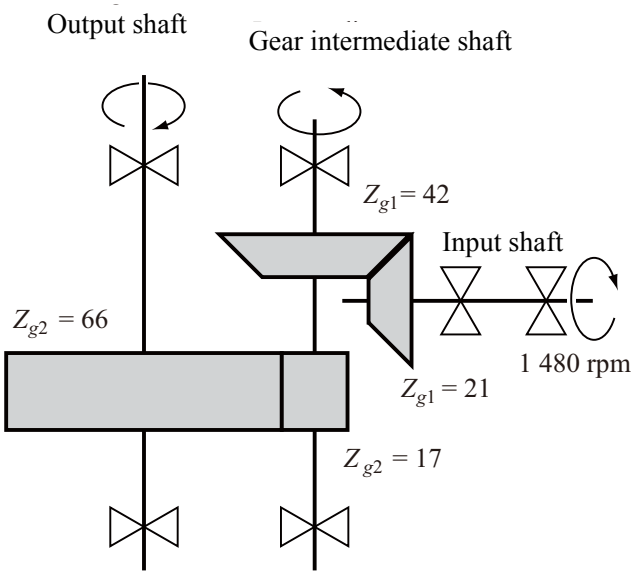

Fig.1: Arrangement of gear reducer

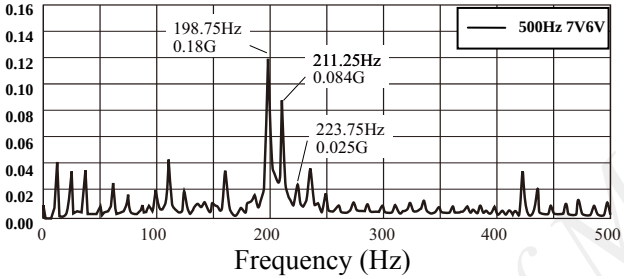

Fig.3: Frequency analysis of acceleration (Hz)

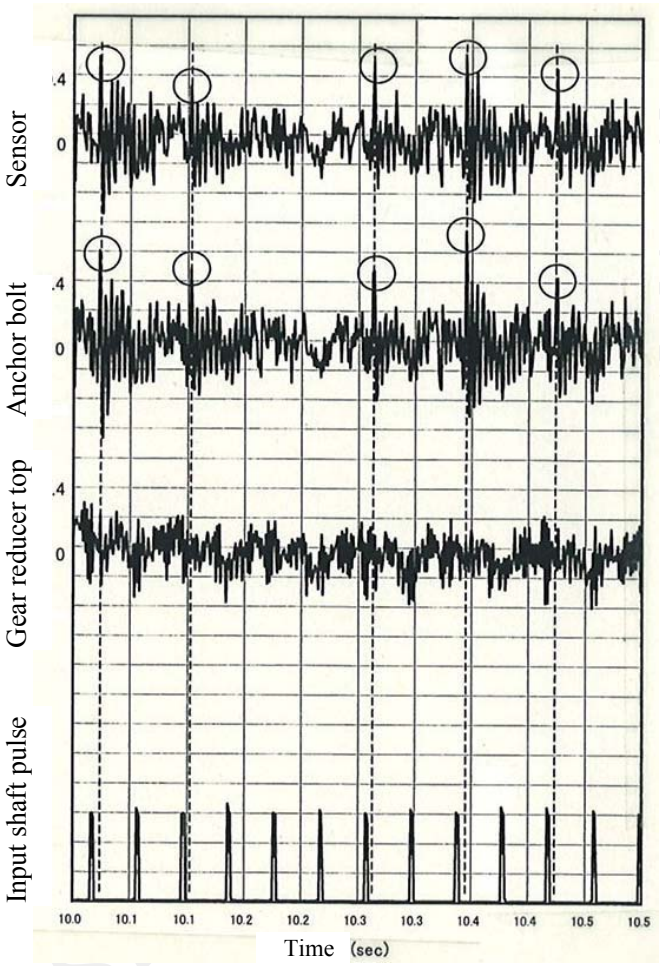

Fig.2: Time history analysis

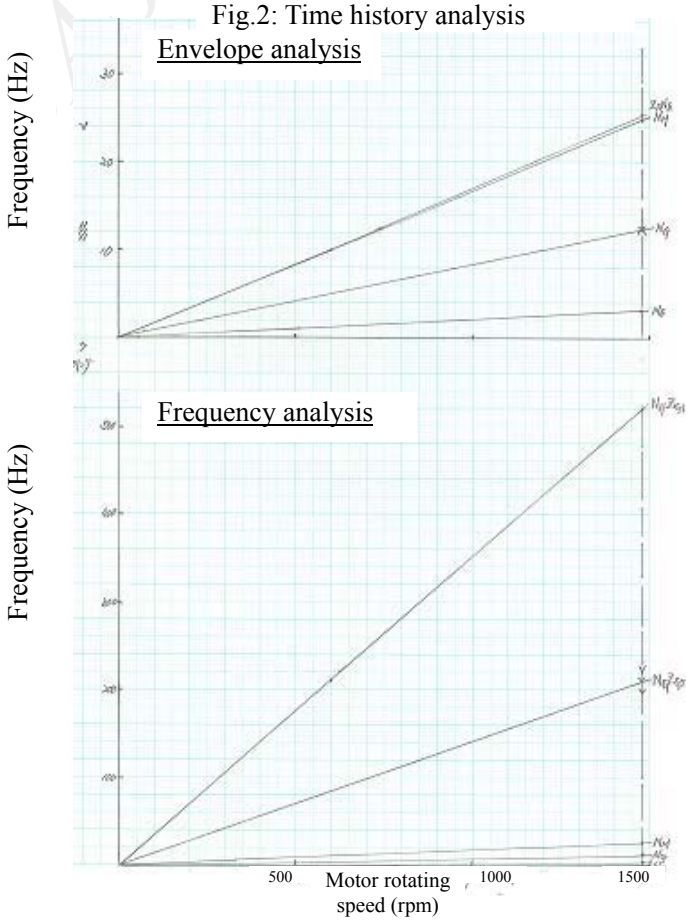

Fig.4: Result of frequency & modulation analysis