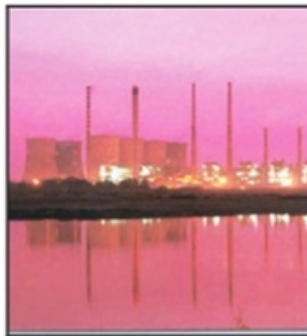


# IIT-M finds way to predict gas turbine glitches

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**Chennai:** At least an hour of production is lost every time gas turbines used to generate electricity in thermal power plants conk off -- that is face combustion instability issues. It not only damages the machine components but also shoots up costs as power generators either need repairs or at worst, replacements. Besides, precious fuel is also lost. Engineers who have encountered the problem for years have not been able to find a steady solution.

But a team at the aerospace engineering department in IIT-Madras has now found a solution to forewarn such problems thereby preventing gas turbines from



Thermal power plants lose at least an hour of production time when gas turbines encounter combustion instability issues. Besides losing precious fuel, such problems also increase costs by forcing repairs and replacements

shutting down. The team has used special sensors to pick up signals of the fluctuating pressure, which are then processed, and a software developed by the team provides early warning that enables the operator to avoid the onset of combustion instability by

making appropriate changes in the operating conditions.

Typically when gas turbines are used in full capacity, there are chances of combustion instability which results in severe levels of sound and vibration that can damage the turbine components. Profes-

sor R I Sujith from aerospace engineering, IIT-Madras said they were able to predict the problem by listening to the sound produced by the combustors during experiments in their laboratory. The team observed a distinctive sound that occurred every now and then, in seemingly no particular pattern just before the machine erred.

Sujith said a stable combustor produces a low humming sound, but an unstable one operates in a sharp loud tone. "Against the old paradigm for instability in combustors, which was simply stable to unstable, we found, after analyzing the data from the time just before the instability, that there is a stage of intermittency between stable to unstable," he said.

The professor, further explaining the technical aspect, said a detailed analysis of the intermittent fluctuations revealed a complex pattern displayed over a range of scales when the operations were stable. "The spectrum of these self-similar patterns is broad at stable operations, but collapses during instability. However, this collapse happens in a gradual manner, as the system goes through a region of intermittent fluctuations, thereby giving sufficient forewarning which enables the operator to deploy strategies to make the combustor operation stable," he said.

The department has applied for a patent in India, US, Canada, UK, Europe, China and Japan.