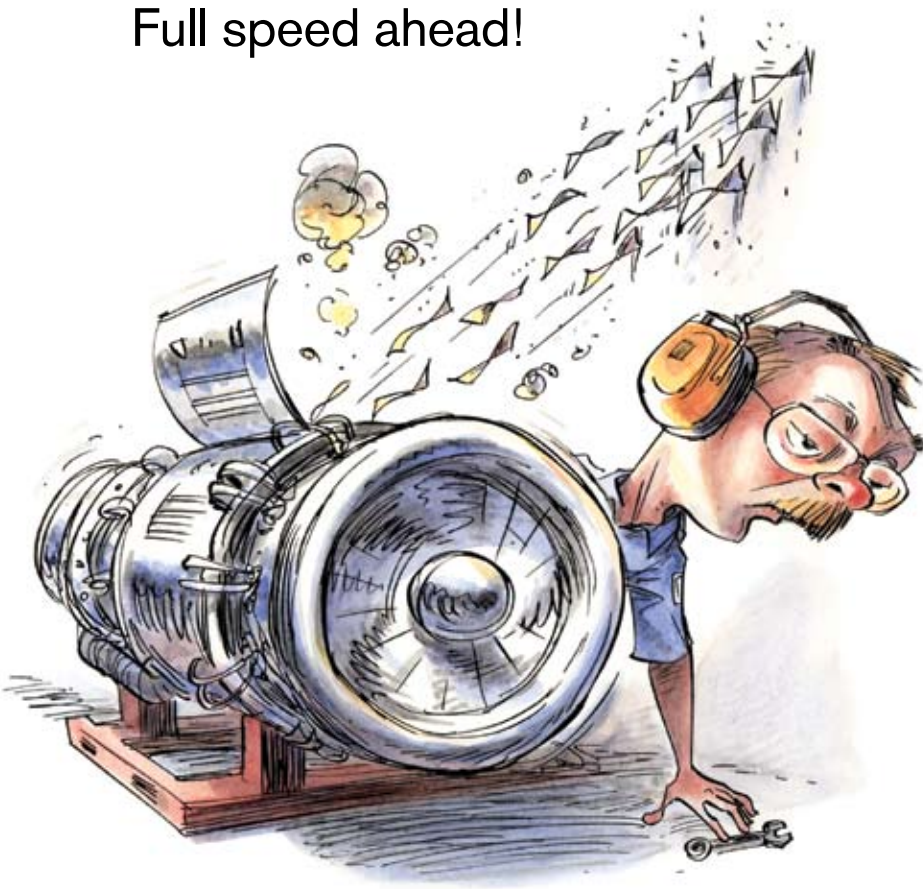


Full speed ahead!



A gas plant was having a speed-control problem with 1800-hp Solar Saturn jet-turbine-driven gas compressors—the same engine that US Air Force jet fighters used in Vietnam. For some reason, the over-speed sensor was failing—a bad situation because only the load of the compressor limited the turbine speed, and if the compressor was “running dry,” there was no load. It could then continue to accelerate to as much

as 36,000 rpm, at which point it would begin to “throw blades.” In other words, the little steel blades on the turbine rotor would begin to come off at a speed such that they would penetrate a half-inch of steel casing and could then keep on going through a number of people if they were in the way. Not good!

The engine’s electromechanical speed-limit switch failed regularly because of vibration. A tachometer generator produced an alternating output voltage whose frequency was proportional to the rate of shaft rotation, and

we were to use this signal to produce an ignition-off output signal if the turbine rose to a speed of 108% of normal.

The circuit consisted of a reference oscillator and a counter to compare it with the input frequency. The counter was made with the ancient HTTL (high-threshold transistor logic) operating at 15V. The tachometer-input signal was the clock input, and the reset signal to the counter was supplied by the reference oscillator operating at a fraction of the tachometer-input signal frequency produced when the jet

turbine was operating at 108% of maximum speed. Then, if the jet-turbine speed exceeded the upper setpoint, the counter would overflow, producing the ignition-off output signal.

We scheduled installation for a -20°F December day. I put the precious box and my tools into the car and drove to the gas-plant site in Carstairs, AB, Canada. The technician took me to the compressor building. We had ear protectors, but the noise and vibration rattled me. The compressor building was about 0°F , and I couldn’t wear gloves during the installation.

The technician shut down one of the compressors, though the noise did not noticeably diminish, and motioned to me to go ahead. The first thing I found was 24V on a terminal strip. That discovery rattled me some more, but, when he came back, he said, “Oh, sorry. I forgot the standby battery.”

When the installation was complete, I checked and rechecked the wiring. It just had to be right: Turbine blades turning me into mincemeat was a powerful motivation. The technician turned on the control panel and began the start-up sequence, and the tachometer needles began to turn. Advancing the throttle, he brought the turbine up to 40% of full speed, then sharply spun the throttle knob up to full speed!

My heart nearly stopped as the tachometer needles spun around. Then, there was a blood-curdling scream and roar as of a great beast in agony, but—luckily—my limit sensor operated, and the turbine stopped. The tachometer needles began to turn toward zero.

I began to breathe again and asked the technician, “Why did you do that?”

“Oh,” he said, “I knew it would work.” **EDN**

Walter Lindenbach started and operated Calgary Controls Ltd (Calgary, AB, Canada) from 1970 to 1990, at which point he discovered an allergy to work and retired. You can reach him at lindenbachw@shaw.ca.

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