Continued from page 30

Yet another benefit: P&W has standardized some aspects of its service proposals to respond more quickly to RFPs (requests for proposal).

Spare parts are easier to obtain, and repair depots are more responsive and able to complete jobs faster than only a few years ago, Kopf said. Note that depots are located in Connecticut, Europe, and Japan. Outside the US, the facilities are operated by a licensee. Good news for owner/operators: Warranty on repair work and parts are now one year; formerly it was 90 days.

In addition, better forecasting tools assure parts are ready when requested—including pre-owned/refurbished parts if the customer prefers. Plus new facilities, repair technologies, and procedures are in place to maximize parts lifetimes. A new test cell for the GG8-1-3 recently was commissioned and dedicated to aftermarket work. Benefits to owner/operators of all these improvements include lower O&M costs and higher unit availability.

Most of the day was spent reviewing publications, technical updates, and responses to questions submitted to the OEM prior to and during the meeting. Perhaps surprisingly, a significant part of the discussion focused on commercial, rather than technical, concerns. Most of the technical questions were on ancillary equipment. In wrapping up, Kopf acknowledged that more robust communication—via a user-accessible website—would benefit customers.

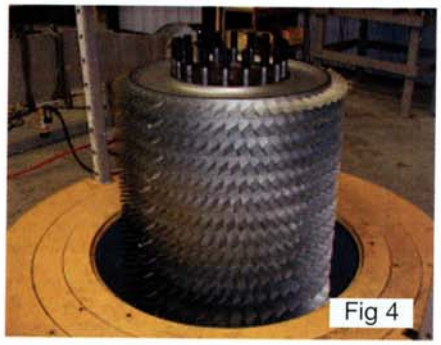


Fig 4

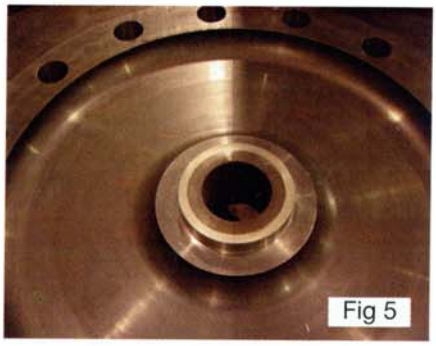


Fig 5

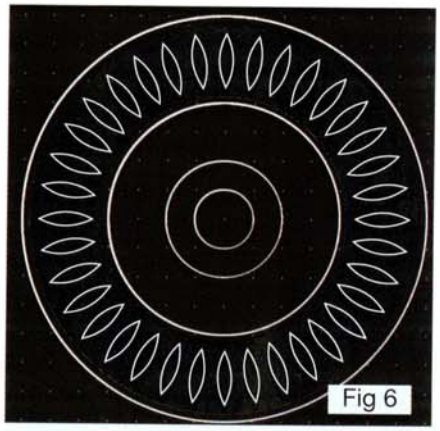


Fig 6

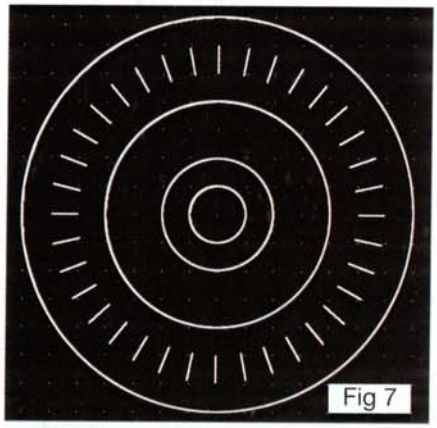


Fig 7

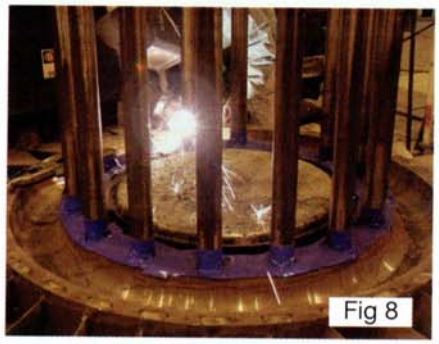


Fig 8

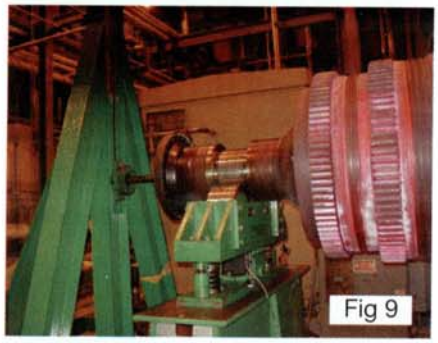


Fig 9

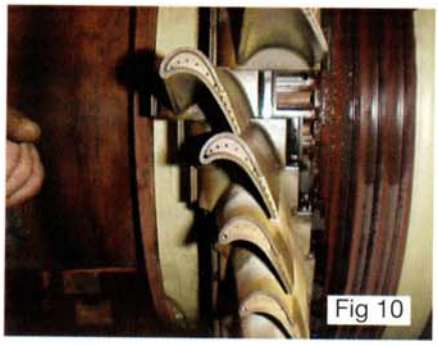


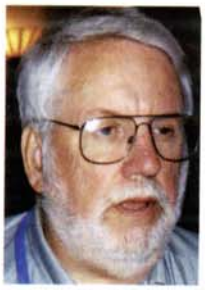
Fig 10


Fig 11

Legacy Roundtable does rotors

Texas GenCo's Steve Hedge, who chairs the Legacy Roundtable, always has an interesting program. Perhaps that's because most of the subjects discussed go well beyond the conventional "fleet issues" that dominate sessions dedicated to late-model engines. Any machine more than about 15 years old is fair game for his program and because long-term operation gives rise to special challenges, both plant managers responsible for legacy equipment and the nostalgic attend Hedge's session.

In Annapolis, the subject of the session was rotors. PSEG Power's Rich Rebori, chairman of the Aero Roundtable, presented on the overhaul of rotors on two 7EAs. He made suggestions on what to look for when inspecting rotors so that others might avoid some of the problems his units experienced. Rebori talked about water collecting in the cavity between adjacent disks (wheels, if you prefer) and causing unbalance. Other problems discussed were cracking of stationary blades, hookfit and compressor casing wear, turbine casing cracks, proper torquing of through bolts, etc. Listening to "plant people" like Rebori is why you come to user-group meetings. The ideas you extract save outage time and expense.


Lucier

One of Rebori's most important messages was to build trust and work closely with your repair vendor. You have to monitor closely all repair work, but it's generally not possible to "live in the shop" for an extended period. Next best thing is to put technology to work for you. For example, in the workscope, make sure you have defined "hold points" for inspection. If you can't get to the shop, have the vendor take a series of digital photos and e-mail them to you. Then review inspection results by phone.

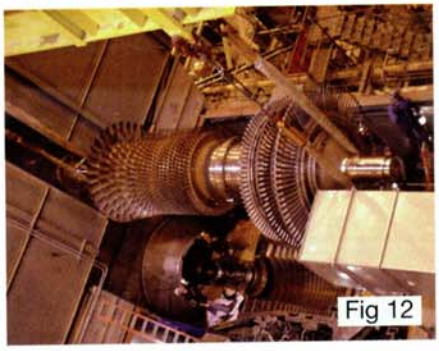


Fig 12

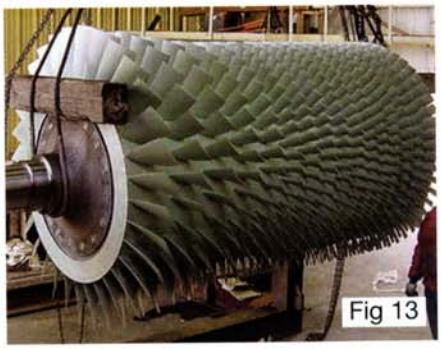


Fig 13

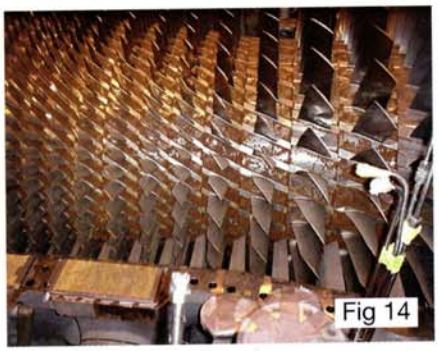


Fig 14


Fig 15

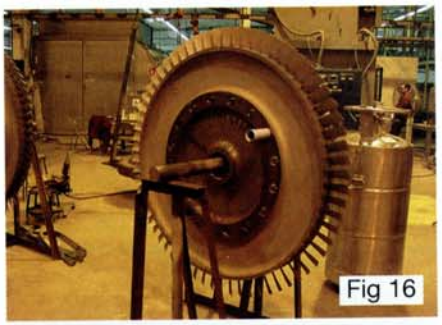


Fig 16


Fig 17

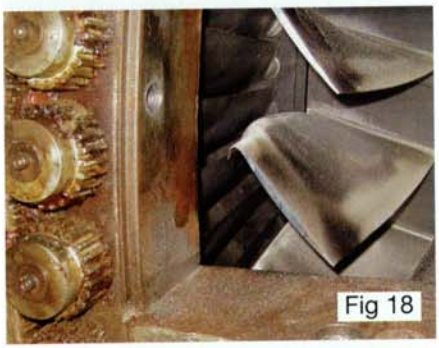


Fig 18

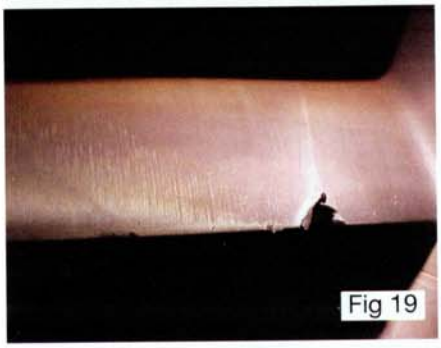


Fig 19

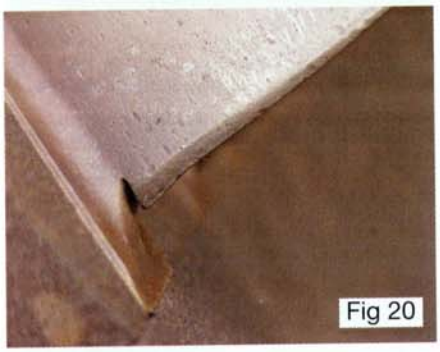


Fig 20


Pond

Charlie 'n Dave. No Legacy Roundtable would be complete without hearing from Charlie Pond and Dave Lucier of Pond and Lucier LLC, Clifton Park, NY (www.pondlucier.com). The two 30+-year veterans have been servicing GTs and teaching service technicians how to repair engines since before the Mark I control system was introduced. Difficult to identify a problem these guys haven't solved or analyzed in their careers.

Their presentation included discussion of the following:

- Rotor design and construction.
- Bore fan problems. If you never heard of them, don't fret. Early MS7000s used to have a bore fan inside the rotor to help pump air to the buckets. The bore fan could become loose and cause vibration. The cure: Remove the fan; designers decided that they were unnecessary.
- Rotor coatings.
- Internal debris.
- Broken through bolts.
- Rotor internal alignment.
- Foreign object damage.
- Inlet fogging overspray.

Rotor design and construction. Rotors are built-up of individual wheels or disks. Each wheel undergoes thorough nondestructive examination (NDE) prior to machining and is balanced after machining. The wheels are then stacked (Fig 4). Centerline is maintained by a Rabbet fit on GE machines (Fig 5), Curvic coupling on Westinghouse engines (Fig 6), and Hirth coupling on Siemens GTs (Fig 7). Note that Siemens uses one through bolt, other OEMs multiple bolts (Fig 8) to hold the rotor assembly together.

After assembly, the entire rotor is balanced without buckets (blades if you prefer, Fig 9), then the buckets are installed (Fig 10), the rotor is rebalanced (Fig 11), and then installed (Fig 12).

Compressor coatings are important, say Pond and Lucier, for preventing corrosion and to help keep the rotor clean. A properly coated compressor rotor is shown in Fig 13. What happens when coating systems are not maintained is illustrated by the rusty rotor in Fig 14 and by the heavy oxidation, corrosion, pitting, and deposits of rotor and stator blades in Fig 15.

The wheel faces are coated on recent models. On the MS5000s, faces were allowed to rust (Fig 16). Random vibration sometimes was experienced from the several pounds of oxidation products that would flake off and remain trapped between adjacent wheels. On some MS7000s, epoxy coatings would peel, ball-up, and cause unbalance.

Another cause of vibration—one characterized by a sudden increase in vibration level—is the failure of a through-bolt (Fig 17). Failure of the through-bolt in single-bolt rotor designs is conducive to rotor destruction. A mod to prevent through-bolt failures on older GE units is described in TIL-1257-3. This is an important reference for any manager responsible for the first-time destacking of an older rotor. An NDE technique for inspecting through-bolts in service was presented by Pond.

If you find blade damage when inspecting your compressors, Figs 18-20 may help identify the source. Ice caused the damage in Fig 18, debris (foreign object damage) in Fig 19, and erosion from over-spray during inlet fogging in Fig 20. CCJ