of cracking and/or pre-crack initiation (Fig 7).

VX4.3-A upgrades. SWPC presented the details on a compressor upgrade for the V94.3A designed to increase mass flow and the potential for an increase in power output of up to 3%, as well as a slight increase in efficiency. Dr Volker Thien (volker.thien@siemens.com, +49 (208) 456-2800) said the upgrade has been successfully implemented and operated for more than a year on 50-Hz engines. The same upgrade is now available for the 60-Hz frame (V84.3A) as a scaled version. The upgrade includes the exchange of inlet guide vanes (IGVs) and the first four rows in the compressor.

In combination with the compressor upgrade, Thien continued, a retrofit package designed to allow turndown to less than 50% of rated load in the dry low-NO_x mode also is available. With this turndown package, also derived from the 50-Hz frame unit, compressor mass flow is reduced by closing the IGVs below the current setpoint.

A third upgrade available is the so-called hydraulic optimization package, which Thien said is designed to increase both power output and efficiency. With this upgrade, the compressor bearing is modified and retrofitted with additional pistons that enable a shift in rotor position during steady-state operation—even at base load. By shifting the rotor in the direction of the compressor, clearances in the turbine section can be optimized and losses reduced.

Thien stressed that all the mods present often can be accomplished during a major outage.

Other OEM roundtables

Legacy Roundtable

The legacy roundtable at CTOTF, which was called to order by Vice Chairman Steve Hedge of Texas Genco Holdings Inc, featured a workshop conducted by Charlie Pond and Dave Lucier (dave@pondlucier.com, 518-330-4801), two former GE field engineers, who are the principals at the firm that bears their names. Pond and Lucier LLC (PAL), Clifton Park, NY, specializes in improving the value of aging GT assets, offering fuel conversions, modifications and upgrades, reconditioning of hydraulic and fuel system components, and a host of other field engineering services.

The PAL workshop specifically addressed (1) troubleshooting GTs with fuel regulator controls, (2) controls upgrade for the MS5001L, and (3) troubleshooting Speedtronic™ Mark I control systems for the MS5001N and MS7001B-C.

Troubleshooting GTs with fuel regulator controls focused on MS3001, MS5001D-LA, and MS3002B-F machines manufactured from 1949-1969. Lucier stressed the value of "cranking tests"—unfired tests that allow you to check the fuel regulator, fuel pump stroke, and gas control-valve stroke. He reviewed how this is done and what data should be recorded. Expected values were stated to provide a benchmark for all users in attendance.

Next, he covered the auxiliaries that are checked during cranking tests—diesel engine, hydraulic ratchet, jaw clutch engagement, torque converter, and dc starting auxiliaries—and what to look for/listen for during the test. Examples: Check that the diesel actually starts after a 30-sec warmup delay, verify that the jaw clutch engages, etc.

Pond and Lucier's PAL5000™ is an alternative to a complete control system upgrade. The package includes a PLC (programmable logic controller) by Horner Electric, the OCS-200 from GE Fanuc's product line, PAL's application software, and programming language by Cscape. A primary feature of the retrofit product is that the fuel regulator, said Lucier, remains "in charge," taking signals—such as fire, accelerate, etc—from input signals from turbine exhaust thermocouples, compressor inlet/outlet pressure, turbine speed, etc.

The PAL5000 can be fully tested and calibrated at cranking speed, added Lucier, and it permits retention of the existing fuel regulator, fuel pump, gas pressure ratio valve, gas stop/control valve, and flow divider. Antiquated components are eliminated or replaced—including thermocouple averaging cabinet, millivolt amplifier, electropneumatic transducer, speed relays, timers, undercurrent relay, auto-load controller, etc.

Troubleshooting Speedtronic Mark I control systems for MS5001N and MS7001B machines made from 1970 to 1973 was particularly valuable given the large number of these machines still in peaking service—such as those units installed on barges off Brooklyn, NY, in the East River.

Lucier's comprehensive library of photographs showed equipment details and how to prepare and conduct troubleshooting tests. GE's Speedtronic "calibrator" allows testing of the Mark I panel—including startup simulation, and monitoring and testing during actual startup and operation.

Lucier stressed that approximately 90% of the circuits can be tested and calibrated without running the turbine; only fuel system calibration requires cranking, and firing can be simulated without fuel flow. Simulation of startup and operation of the plant can be accomplished in about four hours, he said, adding that such simulation also allows observation of auxiliary relay actions.

Alstom Roundtable

Chairman Ed Sundheim (espower@att.net, 973-347-3633), chair of the Alstom roundtable and president, ES Power Support Services, Andover, NJ, reported that the CTOTF information exchange among users was directed primarily at the manufacturer's GT11, N, N1, N2, and NM models.

Sundheim said the discussion in Portland focused on generators—two users presenting reports about recent failures. Last spring's meeting, by contrast, concentrated on corrosion-related compressor failures associated with the GT11N/N1 machines and the action required to prevent them—including non-Alstom options for replacement components with improved corrosion resistance.

Participants in the fall meeting were aware of several generators that failed similarly to the ones described in the case histories presented. Sundheim described the problem as one of in-service failures of the copper clamping lugs that connect the generator's stator winding bars to their radial leads. To present a virtual image of the failure, Sundheim suggested imagining six large copper S-shaped lugs with one end connecting to the radial lead and the other end to the stator winding bar. The failures known to the CTOTF group all have occurred in the middle of the S curve—the point where flexing causes maximum fatigue.

The failures, Sundheim added, initially were attributed to the manufacturing process although subsequent user-driven investigations indicate that winding vibration and lax QC may have contributed to the problem. Replacement lugs were characterized by improved metallurgy and machining that did not create stress risers. This fix proved inadequate for at least some situations, continued Sundheim, and a lug design in the shape of a lower-case "b" (shaft connects to the radial lead and lower loop surrounds and clamps to the end of the winding bar) was offered as a substitute for the S bend. The jury is still out on this design.