# Critical-path tensioning by specialist supervision

Reactor head retensioning is on the critical path during outages, so when an unexpected outage occurred before planned tensioner system maintenance had been done at Niagara Mohawk Power Corporation's Nine Mile Station I, the tool manufacturer was asked to send a service specialist to oversee the entire detensioning and retensioning sequence. The supervisor sent was able to deal with several minor problems as they occurred, ensuring that the entire procedure went smoothly and within schedule.

**by JOSEPH LOSITO III & JOHN MCINTYRE**

In 1980, Nine Mile Point I was retrofitted with four quick-disconnect air-actuated tensioning systems used to open and close the main head of the reactor pressure vessel. The air-actuated system requires one worker per tensioner rather than the two required for a manually operated tensioner because of the physical labor involved. With the quick-disconnect arrangement, an air-actuated segmented chuck engages mating parallel grooves in the stud, avoiding the fatiguing job of manually threading and unthreading studs. This system avoids operator fatigue and reduces exposure time by up to 95% - calculated at 0.017 man-hours per stud compared with 0.35 man-hours per stud with the conventional screw-on system.

ESSENSTIAL, REGULAR SERVICING

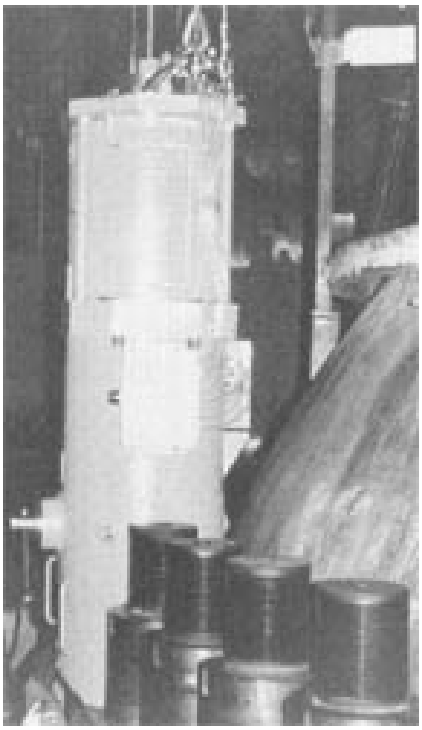
Hydraulic stud-tensioning systems operate at high pressures, typically over 7000 psi. Refuelling/maintenance outages at Nine Mile Point are scheduled for approximately every 18 months.

In view of the relatively long periods of inactivity between concentrated usage during outages, maintaining the tools in good condition is important. It is practice to schedule a manufacturer's service representative to rebuild and test tensioners before every outage. Components such as hydraulic cylinders, couplings, seals, hoses and pneumatic lines - which may dry out and fittings - which may loosen up – are checked, maintained and, if necessary; repaired or replaced.

Since extended detensioning time at the reactor head involves costly operator exposure, it is considered good stewardship to invest the overhaul time in advance. With 12 years experience of the air-actuated tensioning system at Niagara Mohawk Power Corporation's Nine Mile Point I, the plant's mechanical maintenance staff are aware of the importance of comprehensive tool maintenance before and after each scheduled outage and the work needed is routinely scheduled and performed.

RESPONDING TO A FORCED OUTAGE

In May 1992 an unexpected forced outage occurred, so the usual pre-outage preventive maintenance had not taken place. It was decided to arrange for a manufacturer's service specialist to be present during the outage to oversee the entire detensioning and retensioning sequence.



*Sitting on one of 64 studs: one of the four Biach quick-disconnect tensioners at Nine Mile Point*

During detensioning of the reactor head some problems with hoses and limit switches arose. Although these were minor, their repair would have disrupted the tight deadlines set for the forced outage. If problems had persisted during retensioning, the critical path would have been affected. A day or even two might have been lost, at a rate exceeding $750,000 per day for outage downtime.

In this outage, the problems caused virtually no delay. The manufacturer's service representative knew which repairs to suggest and how to correct each situation as it arose.

When work was completed inside the vessel, the representative also directed the critical path retensioning, which was concluded in record time.

ACHIEVING A RECORD RUN

Proper reactor pressure vessel detensioning is important, but other work proceeds while the head is being removed. Retensioning, however, is on the critical path because at this point most other work has been completed and start-up awaits reassembly of the reactor pressure vessel.

At Nine Mile Point I the reactor pressure vessel head has an 18 feet 9 inch inside diameter. Sixty-four studs, each six inches in diameter, secure the flange. The quick-disconnect reactor pressure vessel closure tensioning system comprises four hydraulic tensioners in a carousel. The tensioning crew for the forced outage consisted of one operator controlling the hydraulic pump, and one for each of the four tensioners, supervised by the manufacturer's service representative.

Detensioning is usually accomplished as a two-pass program. The bolts are loosened progressively and then the process is repeated. Retensioning involves two tightening passes and a trim pass. When time is pressing the trim pass may be limited to adjusting any studs which are obviously out of specification. In this outage the work was proceeding so far ahead of schedule that maintenance management agreed to a complete pass, trimming each of the 64 studs. The pass took just 55 minutes, a record time.

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# Outage Management

This smooth and speedy completion can be attributed to crew familiarity with the procedure and the presence of the service supervisor. While service specialists have always offered staff training, this hands-on training experience during an actual outage was invaluable. The representative discussed the operation of the tensioners, and the significance of tensioning versus torquing, in non-technical language understood by everyone on the maintenance crews. As a result of his presence during the forced outage, the reactor pressure vessel tensioning system was serviced, ready for the next operation, and the crew was trained in its use.

The successful and timely completion of this forced outage showed the advantage of having a service specialist on-site during critical procedures. It is a good insurance against unexpected delays, with additional benefits of educating staff and preparing tools for their next outage. A manufacturer's service representative will be retained for standby assistance during all future tensioning procedures.

*Dangling over Nine Mile Point's unit I reactor pressure vessel head: four Biach quick-disconnect tensioners.*