

OUTAGE SEASON

A large industrial turbine is the central focus of the image. A worker wearing a white protective suit and mask is positioned in the lower-left foreground, using a high-pressure water spray to clean the turbine's internal components. The turbine's interior is filled with complex machinery, including a large circular structure with multiple blades or vanes. The scene is dimly lit, with the primary light source being the spray from the worker's equipment.

Outages and elephants

*If either is approaching,
be sure to make way...*

Understanding lube oil analysis

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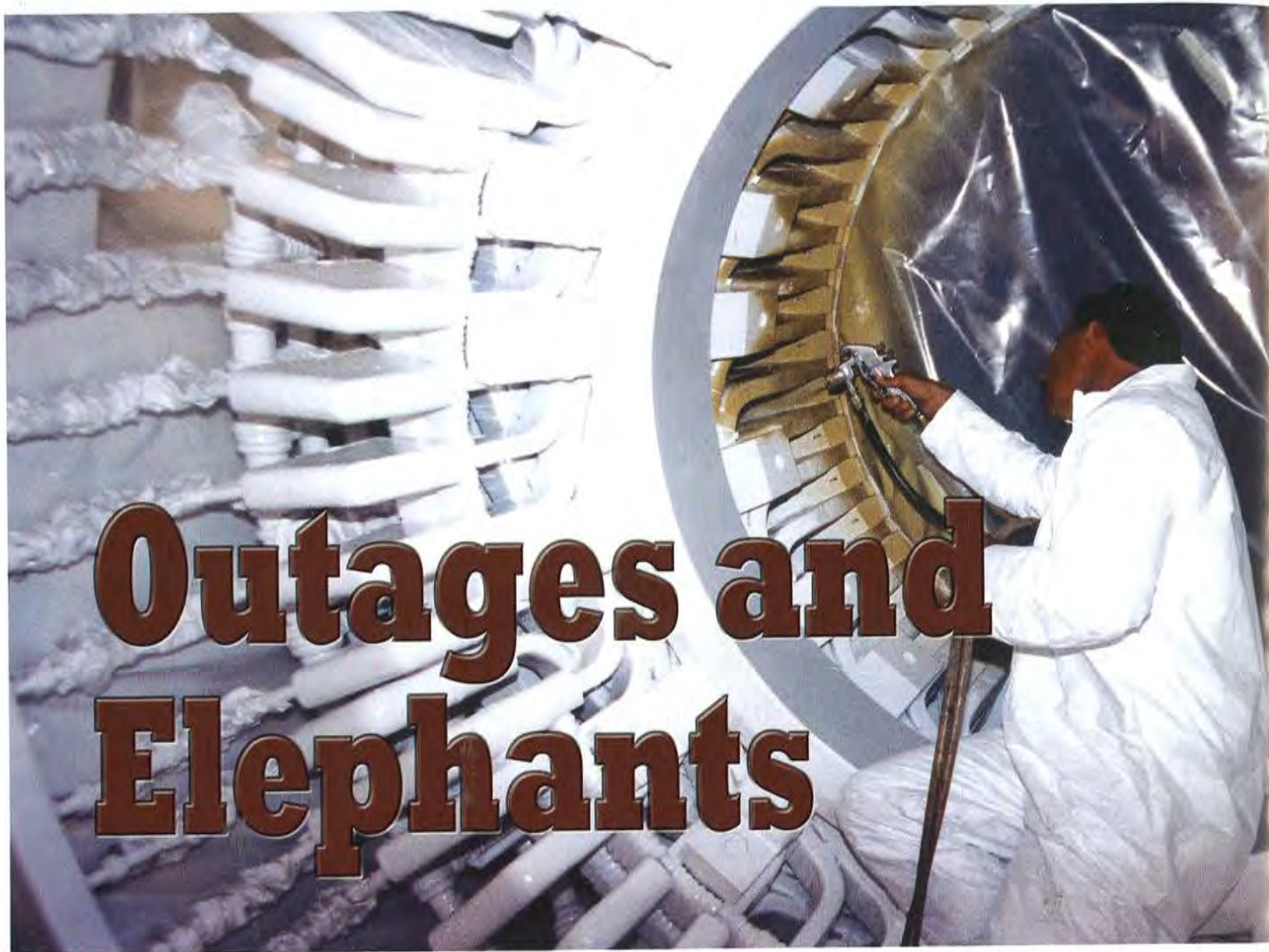
Outage maintenance services

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Outages and Elephants

If either is approaching, make way. . .

By William C. Shumay, Jr.

It's one of those times when we really need everyone to be at the top of their game. Years have gone by since the last scheduled outage, now it is again just weeks, narrowing down to days, for teams of managers, engineers, and technicians to accomplish maintenance and upgrade tasks of critical importance. It's an elephant stampede: Equipment is torn down, piping ripped up, and life as a plant denizen turned inside out. Time is of the essence.

But what if everyone is not at peak performance? Planned outages at power plants are not, almost by definition, done very often. An industry that used to accept major outages at 3-year intervals would now like to see them a decade apart—and more. The scheduled outage could become so rare in one's professional career that eventually the definition of a power plant “old hand” may be someone who can scare young engineers with tales that begin: “It was during a PLANNED OUTAGE once, you see. . .”

Taking into account today's mobile, job-hopping workforce, the trend to longer outage intervals means that it is increasingly possible to end up with lots of long-time industry workers who have worked here and there—yet never have had to deal



Photo courtesy of Environment One Corporation.

with a full-scale planned outage. And longer times between outages also means that power plant owners are becoming less inclined to keep in-house maintenance teams at full capability. If most of those skills are rarely used, an owner in the new competitive marketplace inevitably asks: "Why keep them all on the weekly payroll?"

Sweat the small(er) stuff

There are big turbine issues, there are big boiler issues—and nobody is going to miss giving lots of attention to the heavy hardware. But when the outage is planned, who remains in the trenches to point out that generator systems with mazes of piping and wiring have got to be part of the upgrade?

Big operators are "letting go of [in-house] expertise and contracting from people like ourselves," says

Ron Brosnihan, vice president of utility systems business for Environment One (eone.com), "So our company does get involved at the planning stage, as well as with installation."

Environment One emphasizes the importance of auxiliary systems such as their modular "Gas Station" that replaces a wall of complex hydrogen plumbing and gauges with a single palletized unit. And instead of that ancient nest of wire bundles, this unit satisfies data acquisition needs for generator hydrogen cooling with just a two-wire connection. (If one can upgrade an antiquated in-house system with a modular, easily serviced unit—that's a task worth adding to the schedule.)

In what may be an indicator of the future of the plant upgrade process, Environment One management considers itself to be a partner in the whole outage planning exercise. And they point out that they stay on good terms with all the major hardware manufacturers so they can "get someone else on the line who may have exactly what the customer needs," says Brosnihan.

"We do generator monitoring field service—but what [technology] we recommend is not just what we make," says Steve Kilmartin, utility products specialist, "It's a question of fitting the strategy to the available resources—to try to utilize what the customer has available."

George Vorsheim, Environment One's director of communications emphasizes that the real value comes when outside experts help plant management answer the question: "What are the things that I can plan for that give me the confidence that my next outage can wait five years rather than three?"

Tight spot for the one-man machine shop

When Tom Feehan, head of marketing for D.L. Ricci Corporation, looks at the scope of what must be done during an outage

period, he's thinking small—in a big way. His company's portable machining tools take an entire shop into narrow passageways, through access panels, behind boilers—and worse.

The strength of his company, Feehan says, is not just the unique equipment they sell, but "portable machining solutions" that, often as not, involve putting his experts to work on customizing the precision tools to fit right into a customer's impossibly tight workspace. And this is work that would normally take tons of equipment out in the open in a typical machine shop.

A hands-on attitude is quite compatible with the trend for power plant maintenance skill "outsourcing," so it's no surprise that D.L. Ricci (dlricci.com) finds two-thirds of its business now involves "as-needed" (and even "jump and run") temporary on-site use of its equipment, instructors, and machinists. And in an outage, it's not just how well you do it, it's how fast you do it well. They have sent major teams of men and precision machines across the country to meet urgent outage needs with less than 24 hours notice.

"It is often, now, a contractor relationship—working on-site under a tight schedule, pulling extra hours, doing double shifts—and more," says Feehan.

The company's drive toward lightweight portable machining systems (furthering their goal of "one man instead of two") has been paying dividends: D.L. Ricci has just had one of their "best seasons ever."

Measurements are everything

In the power generation industry, just like throughout much of our mechanized world, operation of complex equipment depends on the physics behind the behavior of heated gases. Hot gas and steam works over a wide range of conditions—but for high efficiency, the process is just



Specialist working on E/One Gas Station installation and start-up. The E/One Gas Station is a modular approach that combines monitoring and control systems into a single integrated platform, customized to meet specific site requirements and budget parameters. (Photo courtesy of Environment One Corporation.)

right only when tolerances are closely held.

To do that, one has to know what is going on inside the turbine. Really know what is going on. That is done, ultimately, with a steam path audit.

Fred H. Kindl, chairman of Encotech (encotech.com) acknowledges that "Not everybody in the world needs a steam path audit," but many turbine operators are missing this important opportunity to get "meaningful measurements" when they have access to the equipment during an outage. And that's when a steam path audit can be a great investment.

"A routine visual inspection is not enough," says Kindl, "You have this equipment spread out, and the question is 'So what?' You've spent a lot to get here, so you have to ask yourself 'What can be done?' Our main suggestion is to take this

opportunity: Do a steam path audit. It can tell you if some parts are even worth fixing."

Encotech is an innovative power plant software, measurement, and consulting organization with the goal of "making the decisions of power plant engineers simpler." And simplification doesn't always come easy: One has to start from a solid base of system efficiency. And precise measurements.

"When you get the machine open—we're right there," says Kindl, "There are lots of measurements to make—it may involve three to four days on a 600 MW unit—but we have never delayed an outage. And we present the report before we leave the station."

Close coordination with power plant management is part of the equation. Encotech is asked to prepare documentation for plant upgrades, and is experienced in failure resolution work. Many in the industry have taken advantage of the power plant engineering seminars they offer.

You want how much efficiency?

Jerry Johnson, vice president of sales for Turbo Parts LLC was taken aback a bit when he found out that a turbine outage job came with a commitment for a 1.5 percent heat rate reduction. He explained to others in his company the sobering reality: They would have to deliver, in effect, nearly 2.2 percent in improved unit state line efficiency. Just from steam path sealing work. A tall order.

The benefit for the customer would be huge, with payback for the new seal work in less than one year of power plant operations.

This was a tough one. But Turbo Parts (mdaturbines.com) has become an agile vendor in this increasingly competitive marketplace—and has used innovation to keep up. Johnson

had a trick or two up his sleeve. Two in particular: Patented seal designs that work together to not only improve reliability over the increasingly long haul between outages, but that actually improve turbine efficiency as well.

The Turbo Parts Guardian seal provides a reliability advantage because it protects the labyrinth teeth during excursions that normally cause damage and efficiency loss. (Low-friction posts built into the seal take the brunt of any rubs that occur.) To actually improve efficiency, the secret is the Vortex Shedder seal: A toothed spill strip for the bucket cover that generates small vortices for better sealing. And it does so with longer seal life at high efficiencies.

Despite additional attention need by the turbine, the whole package including the seal upgrade was done within the time available, which is not trivial, since, as Johnson points out, "The industry is not only extending the time between outages, they are cutting the time to conduct the outage."

After the unit was returned to service, a series of tests over a 5 month period showed that they had made their mark: A 1.51 percent heat rate reduction corresponding to 2.2 percent improvement in unit state line efficiency. (*The paper outlining this work, "Turbine Seal Performance Enhancements at AES Cayuga," is available from EPRI (epri.com).*)

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Outsourcing for special tasks: Gun for hire

Outsourcing is now a "loaded" word, co-opted by today's news media and politicians to evoke concern about the modern phenomenon of staff reductions in traditional industries. But outsourcing has always been an integral part of a free economy. It's not new, and it has a rich history. Think back to the gunfighters hired to protect the interests of those who had to raise families and do business in the wild American frontier.

Safety and security tasks were outsourced successfully out West using these temporary employees—cost-effective because they were brought on only during periods of great need. And contrary to what you may have heard, professional gunfighters were more often peacekeepers than anything else. Several famous lawmen of the period were hired guns subsequently promoted to an official government position.

Slap leather

If power plant maintenance and upgrade outage periods are separated by increasingly longer intervals, economic realities will dictate outsourcing of certain specialized, rarely needed skill sets. Tasks pushed back

to once a decade are likely to be farmed out to independent professional organizations that service multiple sites—and who keep all of their people quite efficiently busy.

These hired guns had better be good, because if they don't perform to expectations they are out the door and the next company in line will be right in. The outage clock is a particularly stern taskmaster.

And herein is the secret advantage for the plant operators that only a free market can provide: Competition for their business. It may only look like the Wild West—that jumble of candidate companies vying for selection as a key vendor—but all that noise is music to the ears of a beancounter.

Competition means more than just competitive pricing; it puts pressure on motivation, efficiency and quality. In a positive way, generally, since the marketplace only has assignments for the free agents who measure up. The rest will have to find something else less demanding to do.

Well, it was true in Deadwood.

—William C. Shumay Jr.

The Prescription for your Aging Unit

E/One Utility Systems and services help you minimize forced outages and maximize your generator's performance. E/One advanced condition monitoring and predictive maintenance technologies are the prescription to decrease downtime – and increase profitability.

E/One offers customized solutions for all types of generators, from consulting, site evaluation, installation and support, to training, upgrades, and turnkey service. With a full range of products for hydrogen and air-cooled generators, we've got you covered in your most vulnerable area.

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With corporate headquarters in New York and regional offices and distribution throughout the industrialized world, Environment One is a manufacturer and provider of:

- Products and services for the disposal of residential sanitary waste
- Utility systems for the protection and performance optimization of electric utility assets



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