

Lipták Talks Nuke Plant Safety at Harrah's

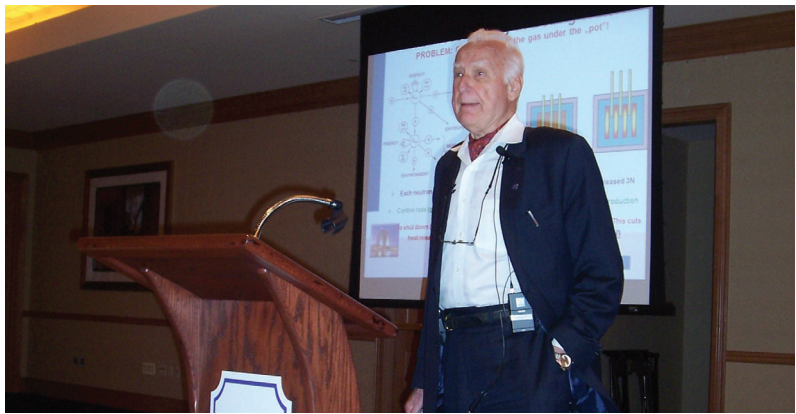
ISA Will-DuPage chapter scores visit from process control master and editor of the *Instrument Engineers' Handbook*.

Control's legendary contributor and editor of the *Instrument Engineers' Handbook*, Béla Lipták, made a rare Midwestern appearance on May 22 at the ISA Will-Page Section's technical meeting at Harrah's Casino in Joliet, Illinois. He talked about "Fukushima Failures and the Next Generation of Nuclear Power Plants" to close to 70 attendees, and described how automatic controls could have prevented recent nuclear plant disasters and can prevent future accidents.

"None of the three accidents at Three Mile Island, Chernobyl and Fukushima would have occurred if those plants had been designed and run with help from process control people," says Lipták.

Lipták adds that nuclear power is just like boiling water on a stove where the heat can't be turned off, so it's crucial to make sure the process can't run away. Nuclear reactors are usually SCRAMed, or slowed to 5% of heat release, by lowering control rods between their uranium fuel rods. But if they lose cooling water, they can still melt and contaminate their local environments. "SCRAM stands for 'safety control rod axe man,' and this manual-control mentality still persists today," explains Lipták. "If the fuel rods' zirconium coating melts, it can react with steam to produce explosive hydrogen. And if there's oxygen present in the air, then all that's needed is an ignition source to cause an explosion."

Lipták stresses that Three Mile Island, Chernobyl and Fukushima were caused by design flaws, such as having only single containment at Chernobyl, and bad operator actions, such as putting water into the instrument air system at Three Mile Island. Likewise, backup cooling and safety devices are often turned off, and manual systems



AUTOMATION MAN

Béla Lipták argues for automated controls that can't be overridden to prevent accidents such as Fukushima, Three Mile Island and Chernobyl.

don't have alerts and alarms. "If these plants had automated controls, they could have detected hydrogen and been flooded with nitrogen to prevent an explosion," adds Lipták. "Half of nuclear plants still don't know how to measure boiling water levels in their systems."

In Japan, some operated devices at Fukushima had no feedbacks or graphic displays, so users couldn't tell if components such as valves and pumps had responded. Meanwhile, diesel and battery backups were on its ground floor, where they were flooded and put out of commission by the tsunami that arrived 74 minutes after Japan's offshore earthquake on March 11, 2011.

"At Fukushima, a steam-turbine-driven pump would have pumped cooling water from a wet well to cool the reactor, but because of a false level indication, the operators shut it down!" adds Lipták.

Consequently, Lipták recommended that nuclear plants adopt gravity-based, thermal and mechanical solutions for cooling reactors that don't depend on energy sources and can't be turned off. This could include storing

water above reactors or installing reactors beneath an artificial lake, which would automatically flood when meltdown precursor conditions arise, and make them incapable of happening.

"We're still in a culture that trusts human beings more than safety controls," adds Lipták. "Airplane pilots land at unsafe speeds and ferry captions turn sharply into unsafe currents, even though simple speed sensing and control devices could indicate unsafe speeds and conditions. We don't accept that safety can be gained by using automatic controls over human activities in unsafe situations. Unfortunately, while traditional chemical and electrical professionals don't hate us, they also don't know that we exist, even though our process control profession is a most valuable one that can serve to prevent many problems and accidents."

Much of Lipták's investigation and analysis of nuclear power plant shortcomings and possible accident-prevention strategies will be published in his upcoming ISA book, *The Next Fukushima: Automation Can Prevent It!*