



Case Study: Hong Kong Power Plant

Power generation facility uses Opto 22 control systems for heat, pressurization, and other critical processes

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BACKGROUND

The Lamma Power Station is located on Lamma Island, just a 30-minute ferry ride off the coast of Hong Kong. With its distinctive tall chimney stacks, the power station is visible from most of the surrounding islands.

Hong Kong itself has close to 7 million residents, and the Lamma Power Station uses complex transmission systems that include underwater pipelines to deliver energy for 40 percent of this population.

The facility has a capacity of 3,420 MW, produced by eight coal-fired units, five gas turbine units, and one combined cycle unit. The station was developed in three stages. Stage

I deployed three 250 MW coal-fired units; Stage II added three 350 MW coal-fired units, one 55 MW and six 125 MW gas turbines; and Stage III added two more 350 MW coal-fired units.

All of this power generation equipment utilizes Opto 22 Ethernet-based hardware systems to control and monitor heat, pressurization, and other processes during operations.

As described, the majority of the power generating units at Lamma center on coal firing. Opto 22 controllers connect to weigh scales, conveyors, pressure transducers, and thermocouples, to ensure that the coal burning operations take place safely and optimally. For example, analog I/O



Lamma Power Station

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modules wired to scales measure the weight of the coal prior to its delivery to the furnaces and send these figures to the controller. Based on these readings—and whether they're low or high—the controller then instructs the conveyors delivering the coal to the furnaces to speed up or slow down appropriately, so the furnaces generate the proper amount of heat needed to spin turbines that produce the power.

At the same time, integrated circuit temperature derivative probes (ICTDs) connected to thermocouple analog input modules monitor the actual furnace temperatures, which are then used in PID calculations to regulate the temperature via analog output modules. Accurate readings and close control is essential, so several thermocouples are used for each unit.

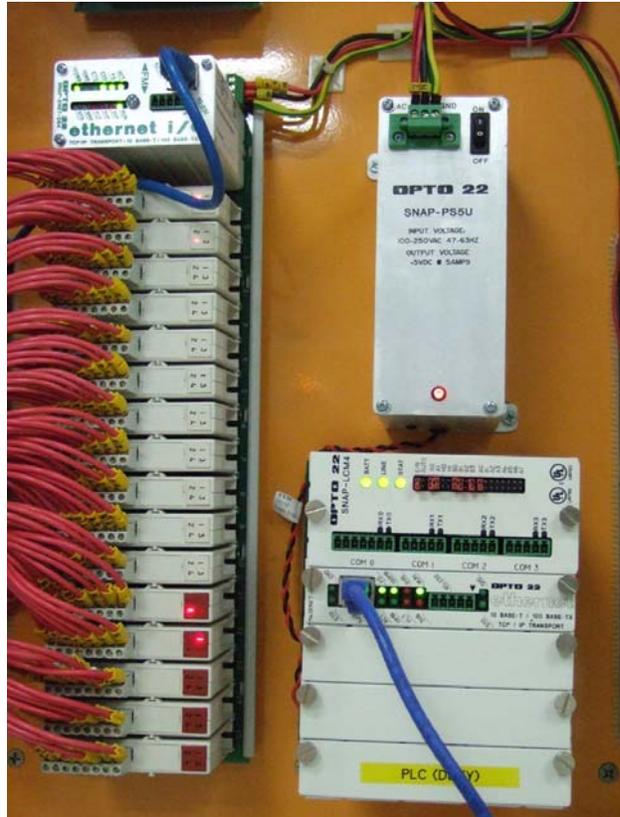
"This part of the application is extremely important, so we have the Opto PACs closely monitoring the temperatures and regulating them in a way that 'hot spots' are avoided," says Bruce Lai of Mix Technology, the systems integrator that installed many of the Lamma Power Station's control systems.

Lamma is also using the Opto 22 systems to monitor transducers that measure the pressure in and around the furnaces to ensure that the coal burns and the resulting heat are converted into energy in the most efficient way.

A HISTORY WITH OPTO 22

In the mid-1990s, the Hong Kong Electric Company (HEC), which manages and operates the Lamma Power Station, identified the need for additions to its facility in order to sustain the social and economic growth of Hong Kong as it entered the 21st century. Wary of the negative ecological effect of burning fossil fuels, the HEC sought to minimize the environmental impact of any new power generating facilities it would undertake by adopting gas-fired combined cycle technology for the new Lamma Power Station extension.

The existing Opto 22 mistic systems had been up and running flawlessly since the Lamma Station opened, even as other non-Opto system components were beginning to fail.



Opto 22 controllers and I/O systems control the entire Lamma Power Station facility.

Lai (and partner Gary Kwong's) company Mix Technology won the contract to upgrade the control systems for this extension, which generates power using natural gas. This contract consists of complete project management, including procurement, wiring, networking, installation, and training.

"When we got into Lamma, we sold them on control systems utilizing Opto 22's new line of Ethernet-based SNAP-brand programmable automation controllers," says Kwong. "We didn't realize until that time that throughout the entire plant, every one of the coal-burning units was already using Opto and the older mistic systems."

This hardware, as Kwong and company soon learned, had been up and running flawlessly since the Lamma Station opened, even as other non-Opto system components were beginning to fail. With Lamma personnel already sold on the performance, reliability, and longevity of the Opto 22 brand, Mix proceeded with its installation, deploying SNAP PACs in Lamma's new extension and programming the hardware with PAC Project™—the

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Artist's illustration of the Lamma Power Station

automation software used with Opto 22 SNAP PAC systems. These products replace already installed mistic controllers. The changeover from the serial-based mistic platform to SNAP PACs was made easier thanks to PAC Project's import utility that lets mistic users convert their control strategies and HMI screens for use with SNAP PAC systems.

"Opto 22's Product Support organization went above and beyond to help with this migration," says Lai. "This, combined with Opto's easy to use software and commitment to using open protocols in its product designs, is what made us so confident when we made our decision to leave Johnson Controls to focus on marketing the Opto 22 line in Hong Kong."

Mix Technology, which in addition to power-related applications, also specializes in the automation and monitoring of water systems and tunnel lighting, will soon be tackling perhaps its biggest project ever—a complete retrofit of the entire Lamma Power Station.

"Based on the success we had with the extension, we've now been tasked to retrofit the entire plant with Opto 22 SNAP PAC control systems."

ABOUT OPTO 22

Opto 22 was started in 1974 by a co-inventor of the solid-state relay (SSR), who discovered a way to make SSRs more reliable.

Opto 22 has consistently built products on open standards rather than on proprietary technologies. The company developed the red-white-yellow-black color-coding system for input/output (I/O) modules and the open Optomux® protocol, and pioneered Ethernet-based I/O.

In early 2013 Opto 22 introduced *groov* View, an easy-to-use IoT tool for developing and viewing mobile operator interfaces—mobile apps to securely monitor and control virtually any automation system or equipment.

Famous worldwide for its reliable industrial I/O, the company in 2018 introduced *groov* EPIC® (edge programmable industrial controller). EPIC has an open-source Linux® OS and provides connectivity to PLCs, software, and online services, plus data handling and visualization, in addition to real-time control.

All Opto 22 products are manufactured and supported in the U.S.A. Most solid-state SSRs and I/O modules are guaranteed for life.



The company is especially trusted for its continuing policy of providing free product support, free training, and free pre-sales engineering assistance.

For more information, visit opto22.com or contact **Opto 22 Pre-Sales Engineering:**

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