IDEA's innovators of 2017

From this year's Innovation Award winner Princeton University to three honorable mention designees, IDEA members exemplify industry-leading ingenuity.

Kathryn Ramsted, Editorial Associate, District Energy

The word "innovation" has its roots in the Latin *novus*, meaning "new." Within the membership of the International District Energy Association, innovation – the introduction of new technologies, member collaborations, engineering approaches or operational practices – is in no short supply. Three years ago, IDEA established its Innovation Award as a platform for showcasing and sharing such creative solutions developed by association members. The award is presented at IDEA's Annual Conference and Trade Show to a winner selected on the basis of criteria in four categories: ingenuity, measurable success, replicability, and economic and environmental benefits.

Last June, Princeton University and Smith Engineering received IDEA's 2017 Innovation Award at the annual conference in Scottsdale, Ariz., for the university's booster chiller project. They teamed up to solve a complex, chronic low delta T issue in a campus engineering building with the installation of a heat-concentrating chiller that yielded outstanding results – in both operating efficiencies and cost savings. In addition, IDEA also bestowed three honorable mention awards this year: to South Dakota State University and Farris Engineering for SDSU's North Chiller Plant, Ball State University for its ground source geothermal district energy system and Empower for its Delta T Pro metering solutions for sustainability.

All of these award winners demonstrated creativity in response to different business problems; their solutions may benefit and inspire others in the industry contending with similar challenges.

Honorable Mentions

IDEA presented the three honorable mention awards this year in recognition of the abundance of innovative submissions received. Conferring those awards in Scottsdale to each of these projects was Bob Smith of RMF Engineering, chair of IDEA's Innovation Award Committee.

SOUTH DAKOTA STATE'S NORTH CHILLER PLANT

In 2016, South Dakota State University in Brookings completed construction of its new North Chiller Plant – an unstaffed, highly efficient and low-operating-cost facility designed to serve the growing northwest sector of campus. The plant replaced air-cooled chillers in a number of animal science buildings and labs, and it also serves the new Dana J. Dykhouse Stadium, home of Jackrabbit football. Farris Engineering of Omaha, Neb., had performed a feasibility study recommending a new chilled-water production plant and oversaw total project design.

To minimize plant water consumption and chemical water treatment applications, the firm pioneered an innovative nonferrous plant piping solution. Instead of traditional grooved or welded carbon steel pipe and fittings, it recommended an entirely fusion-welded polypropylene pipe system for plant chilled- and condenser water lines. Known as polypropylene-random crystallinity temperature (PP-RCT) piping, the new material used in the North Chiller Plant offers corrosion prevention and effective treatment of water systems along with thermal expansion nearly similar to that of copper in this application.

In addition to the new plant, a new chilled-water distribution network was installed consisting of high-density polyethylene piping, which also affords an environmentally sustainable, nontoxic, corrosion- and chemical-resistant system, with a lifespan in excess of 100 years.

Fusion welding was used on both the PP-RCT plant piping and the HDPE chilled-water distribution lines, providing leak-tight joints with verifiable data logging of the fusion process to assure the owner of joint integrity.

The plastic piping materials selected for the plant and distribution system uniquely provide higher system operating pressures at higher temperatures than are typically possible with the alternative nonferrous materials. Pressure ratings were specified to meet and/or exceed those used for carbon steel construction – i.e., system operating pressure capabilities to 160 psi and surge above 225 psi. Use of the poly piping with its smooth interior also gave the plant and distribution pipelines a favorable, low friction factor – for the HDPE, more than 1.15-1.5 times that of the new metal materials after aging (roughness dependent on water quality) – that will remain virtually the same throughout the life of the piping system. (Average Hazen-Williams friction factor, C range from 130 to 155 [source: *Performance Pipe Field Handbook Bulletin PP-901*].)

The North Chiller Plant system design and materials yielded improved energy efficiency – and cost savings too. Hydraulic analysis of the plant and exterior distribution system piping allowed for lower pump head requirements due to the lower and continuous friction factor throughout the life of the piping system – meaning less electrical energy used to move water through the systems and, therefore, lower electrical costs. The use of chilled-water treatment chemicals and their resulting costs are also lower at the North Chiller Plant than at a sister facility built in a similar manner using carbon steel materials. In addition, the piping installation contractor estimated that the light weight of the poly piping materials translated to lower installation labor costs of approximately 30 percent. Materials costs were minimally higher for the nonferrous pipe materials, i.e., less than 10 percent.

Accepting the honorable mention award on behalf of SDSU and Farris Engineering was Farris' Greg Kronaizl, PE, project manager and mechanical engineer.

North Chiller Plant piping, South Dakota State University.