IDEA
INNOVATION AWARD

Chilled Water Network Leak Detection Project

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1. Project / Program Title:
Chilled Water Leak Detection Project

2. Name & Location of District Energy System or Project:
Emirates District Cooling (Emicool) L.L.C, Dubai – United Arab Emirates

3. Name of System Owner:
Dr. Adib Moubadder, Chief Executive Officer

4. Name, relationship to the project/program, address, phone number & email of the person submitting the application:
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5. Executive Summary:
Emirates District Cooling (Emicool) L.L.C is honored to participate in the IDEA Innovation Award 2022. Emicool had secured several awards locally, such as “District Cooling Utility Provider of the Year 2012” and “The District Cooling Utility Provider of the Year 2014” award. Furthermore, Emicool has been recognized internationally, winning the ‘Greatest number of buildings committed to district energy beyond North America’ for eight consecutive years in 2010, 2011, 2012, 2013, 2014, 2015, 2016 and 2017 conferred by the International District Energy association (IDEA).

In 2018, Emicool received ISO (International Organization for Standardization) global certifications for its quality, energy, and environmental management systems. It also became the first district cooling agency in the MENA region to be conferred the Global Conformity GC Mark as a certified green company.

Emicool partnered with European based company (Fast GmbH) and developed new innovative ideas to implement a real time leak detection system for all chilled water networks serving different communities. Recently, Emicool successfully implemented a new leak detection system based on Distributed temperature measurement which is based on the proven Raman Optical-Time-Domain-Reflectometry (OTDR) technique. An optical laser pulse propagating through the fiber is scattered and some of this scattered light is received at the transmitting end, where it is analyzed. As the Raman signal is affected only by temperature, the intensity of the two Raman signals (stokes and anti-stokes, see below Figure) is an absolute measure for the temperature along the fiber. By very accurately measuring the difference in the signal intensity of the backscattered light an accurate temperature measurement can be made.
The differential temperature monitors temperature changes that are a result of a leak. Leaks cause a change in temperature of the optical fiber along with chilled water pipes.

- Chilled water pipelines operate under certain pressure, when a chilled water leak occurs, the change in surrounding temperature is detected to very small margins by the DTS and an alarm shows the leak location.

Temperature profiles, optical loss traces, zone average temperatures, zone maximum/minimum temperatures, faults and other information are recorded and displayable; data can be transmitted. Within each zone several thresholds are configurable, and alarms can be triggered when these values are reached. We can set the alarm criteria based on our chilled water operation temperatures.

With the use a computer base software, a real time GIS view is available for the operator.
6. How the project/program is innovative and unique:

Emicool with European based technology provider (Fast GmbH) is the first District Cooling Service provider to implement the fiber optic based chilled water leak detection system which is unique from all existing leak detection concepts like flow meter, pressure etc. The project is completed using spare cores of the existing fiber optics cables network used for the communication purpose for remote locations as a tool to detect chilled water network leaks which reduced implementation cost of the new system.

7. Improved energy efficiency benefit offered by the project/program:

The chilled water leak detection system will provide early alerts of the underground leaks which will reduce the water losses by rectifying leaks before it magnifies. The early detection will improve the plant operational efficiency by reducing additional chilled water required to overcome the network leaks.

8. Financial advantages of this project/program:

Chilled Water Leak Detection System:

❖ Achievement

- Emicool team managed to reduce chilled water network losses by almost 70% leaks from previous years using innovative leak detection systems.
- The reduction of water losses in the network, resulted in additional energy and water consumption saving for the operation subsequently improvised in financial numbers.

9. Additional information about the project/program:

Successfully completed phase 2 and 3 of the innovative leak detection system at one of Emicool chilled water network, and extend the same concept over other geographical areas under EMICOOL network.
10. Diagrams or Photographs:

Real Time GIS View of Chilled Water Network thermal map: