Background

Large retail hypermarkets run all year, and their air conditioning is mostly supplied by a central chilled-water system. The chiller cools the water, pumps send it to air-handling units across the floor where it absorbs heat from the indoor air, and the warmed return water flows back to the chiller to be cooled again. This loop is often the single largest electrical load in the whole building, so how much power it uses — and how much cooling it actually delivers in return — directly determines operating cost.

Most plant rooms already log supply/return temperatures and chiller power. What they lack is flow: the number that turns a temperature difference into actual cooling delivered. This case study shows how one Taiwan hypermarket closed that gap with two FU-TX320 clamp-on ultrasonic BTU meters, installed while the plant kept running.

What Is a BTU Meter?

A BTU meter, also called a thermal energy meter, measures flow and the supply/return temperature difference at the same time and converts them into real-time cooling capacity and accumulated energy. In a chilled-water plant, it shows how much cooling the chiller really produces — the number that temperature and power data alone cannot provide.

📌 Hypermarket Chiller Plant: How Do You Measure Real Cooling Capacity Without Shutting Anything Down?

> **Case Customer – Large Hypermarket in Taiwan, Chiller Plant Room**

Situation

The hypermarket is cooled by centrifugal chillers with DN300 chilled-water mains. The plant room had only temperature and electrical power data, so there was no way to know the actual cooling output or efficiency of each chiller, and energy-saving work lacked a quantified basis. Because the store trades all year, shutting down, draining or cutting pipes was not a realistic option.



Case site: centrifugal chiller plant in the hypermarket’s basement plant room.

Goals

1. See the real cooling capacity and kW/RT of each chiller
2. Install on a plant that cannot stop: no shutdown, pipe cutting or draining
3. Be able to verify that the measured data can be trusted
4. Get a quantified basis for efficiency improvements, scheduling and equipment replacement

Case at a Glance

Site	Large hypermarket in Taiwan — chiller plant room
Equipment	Centrifugal chiller, DN300 main pipe
Solution	2 × FU-TX320 (chilled-water side + condenser-water side)
Installation	Fully clamp-on — no shutdown, no pipe cutting
Result	Real-time cooling capacity, kW/RT and heat-balance check

📐 Why Can’t Temperature Alone Tell You a Chiller’s Real Cooling Output?

The Blind Spot

The cooling a chiller really produces is the product of flow and temperature difference:

Q = flow × specific heat × ΔT

For water, this simplifies to **Q (kW) ≈ 1.163 × flow (m³/h) × ΔT (°C)**, and 1 RT ≈ 3.517 kW.

With temperatures alone, you know the temperature difference but not how much heat was actually moved. The chiller's real efficiency (kW/RT) cannot be calculated, and waste stays invisible: equipment degradation, low-ΔT operation, pumps moving more water than needed. **A BTU meter measures flow and temperature difference together and turns them into real-time cooling capacity and accumulated energy.**

The Complete Approach

The complete approach is one meter set on **each side of the chiller**. The chilled-water side measures the cooling delivered to the building; the condenser-water side measures the heat rejected to the cooling tower. Energy conservation links the two:

Heat rejected (condenser side) ≈ Cooling delivered (chilled side) + Compressor power

A large gap points to a measurement or equipment problem, so the data can verify itself.

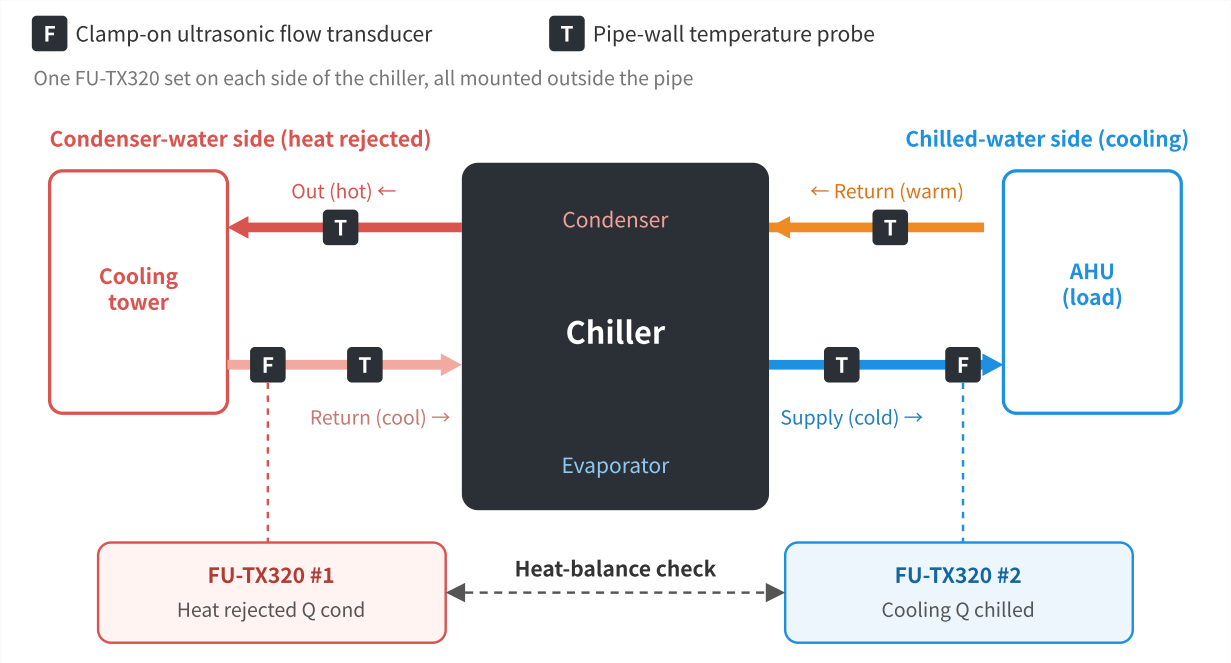

Diagram A: BTU measurement points on both sides of the chiller. One FU-TX320 per side, all mounted outside the pipe.

💡 One FU-TX320 on Each Side of the Chiller: Real Cooling Capacity With No Shutdown

In the existing chiller plant, one FU-TX320 clamp-on ultrasonic BTU meter was installed on the chilled-water side and one on the condenser-water side, while the plant kept running. Each set includes clamp-on flow transducers (clamp + rubber coupling pad) and supply/return pipe-wall temperature probes; the transmitter is wall-mounted beside the plant room electrical panel.

No shutdown: everything mounts outside the pipe — no pipe cutting, no draining

Real cooling capacity: flow and ΔT measured together, giving kW/RT with existing power data

Self-verifying data: condenser-side heat rejection cross-checks chilled-side cooling + compressor power

Stable readings: patented clamp, rubber coupling pad and IP67 transmitter

One set per side: flow and temperature in a single non-invasive installation

➡ Learn more about the FU-TX320 clamp-on BTU meter: www.lorric.com

🔧 Why Clamp-On, and How Does FU-TX320 Keep Readings Accurate?

Why Clamp-On

Chilled-water mains are often DN200 or larger. An in-line or insertion flow meter would mean shutting down, draining and cutting the pipe — almost impossible for a store that trades all year. A clamp-on ultrasonic meter fixes its transducers to the **outside** of the pipe wall and sends sound through it: **no shutdown, no pipe modification, no pressure drop**. The cost advantage over other flow meter types also grows as pipe diameter increases.

The catch is that clamp-on accuracy depends on the transducers being mounted precisely and staying put, which is exactly what FU-TX320 is designed around.

Transit-Time Principle

Ultrasound travels faster with the flow than against it, and the meter converts the transit-time difference into flow velocity ($\Delta t \propto v$); velocity × pipe cross-section gives flow rate. Because the time difference is only in the nanosecond range, **if transducer spacing drifts, the reading drifts with it**.

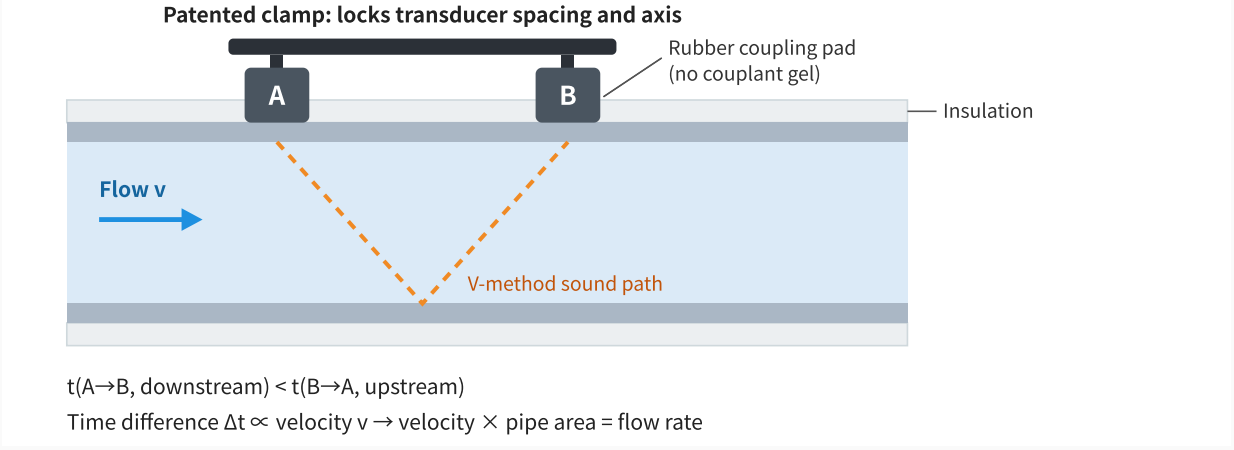

Diagram B: Transit-time measurement and the patented clamp that locks transducer spacing and axis.

Field Pitfalls vs. FU-TX320

Challenge	FU-TX320 Solution
🎯 Transducers shift when insulation is re-wrapped (strap-only mounting)	✔ **Patented clamp:** locks the transducers at a fixed spacing and axis, so their position holds after the insulation goes back on.
🎯 Ultrasonic gel dries out or runs, needing periodic re-application	✔ **Rubber coupling pad:** replaces the gel, so no re-application is needed and the signal stays stable over the long term.
🎯 Humidity and condensation in the chiller plant room	✔ **IP67 transmitter:** rated for humid environments and can be mounted directly on site.
🎯 Temperature must be measured too, without breaking into the pipe	✔ **Pipe-wall temperature probes:** use 1/3 DIN Class B sensing elements, so flow and temperature are covered in one fully non-invasive installation.

📊 On-Site Results: What Did the Hypermarket Learn?

Site Data



DN300 main: clamp-fixed flow transducers plus stainless-steel strap.



Chilled-water-side transmitter: real-time flow (m³/h).



Chilled-water-side transmitter: supply/return temperature and accumulated energy.

Site Operating Data (Approximate)

Measuring point	Flow	Temperature
Chilled-water side	12 in (DN300); about 5,000 L/min (≈ 300 m³/h), about 1.2 m/s	Supply about 11°C, return about 13°C
Condenser-water side	About 6,400 L/min (≈ 384 m³/h)	Water temperature in the 20s °C

Both sides measure flow, supply/return temperature, real-time cooling capacity (chilled side) or heat rejection (condenser side), and accumulated energy.

Chilled-water-side real-time cooling capacity (approx.)

≈ 700 kW (about 200 RT)

1.163 × 300 m³/h × 2°C ≈ 698 kW

Note: values are approximate on-site operating figures used to illustrate the calculation, not acceptance-test data.

Results

For the first time, the store obtained real-time energy data on **both sides of the chiller at the same time**. Chilled-water cooling capacity combined with existing power data gives each chiller’s actual kW/RT, while condenser-side heat rejection provides the heat-balance check that confirms the data is trustworthy.

With this data, the team can judge whether chiller efficiency is degrading, whether the supply/return temperature difference is too small, and whether pumps are delivering more water than necessary. That gives quantified support for efficiency improvements, operating schedules and equipment replacement decisions.

For existing buildings that cannot be stopped, FU-TX320 turns BTU metering from something that *needs pipework modification* into something that can be *added while the plant keeps running*.

Frequently Asked Questions (FAQ)

Q1: Do I need to shut down the chiller or drain the pipe to install FU-TX320?

A: No. The clamp-on flow transducers and the pipe-wall temperature probes mount on the outside of the pipe, so installation is done while the system is running — no shutdown, pipe cutting or draining.

Q2: Why measure both the chilled-water side and the condenser-water side?

A: The chilled-water side gives the cooling delivered to the building; the condenser-water side gives the heat rejected to the cooling tower. Since heat rejected ≈ cooling delivered + compressor power, comparing the two acts as a built-in check. A large gap signals a measurement or equipment problem.

Q3: How do I calculate chiller kW/RT from the meter readings?

A: Take the chilled-side cooling capacity in kW (≈ 1.163 × flow in m³/h × ΔT in °C) and divide by 3.517 to get RT. Then divide the chiller’s electrical power (kW) from your existing power meter by that RT figure. The result is the chiller’s real kW/RT.

Q4: Why aren’t supply/return temperatures and a power meter enough?

A: Temperature tells you the difference between supply and return, but not how much water carried that difference, so the heat actually moved is unknown. Without flow, cooling capacity — and therefore kW/RT — cannot be calculated.

Q5: How does FU-TX320 keep clamp-on readings stable over time?

A: Three design choices address the usual causes of drift: a patented clamp locks transducer spacing and axis even after insulation is re-wrapped, a rubber coupling pad replaces ultrasonic gel that dries out, and an IP67 transmitter withstands humid plant rooms.