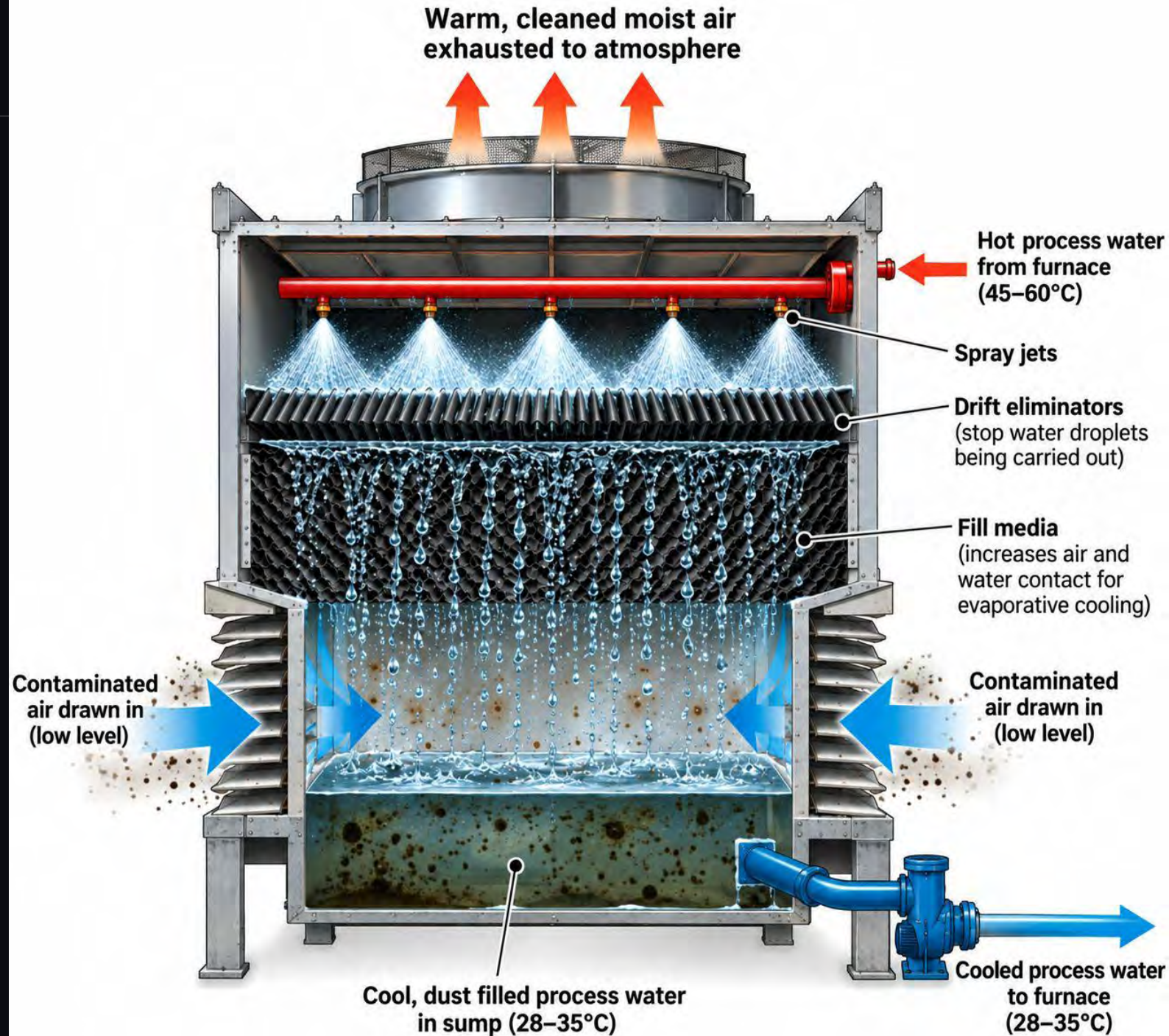


Transforming Foundry Cooling

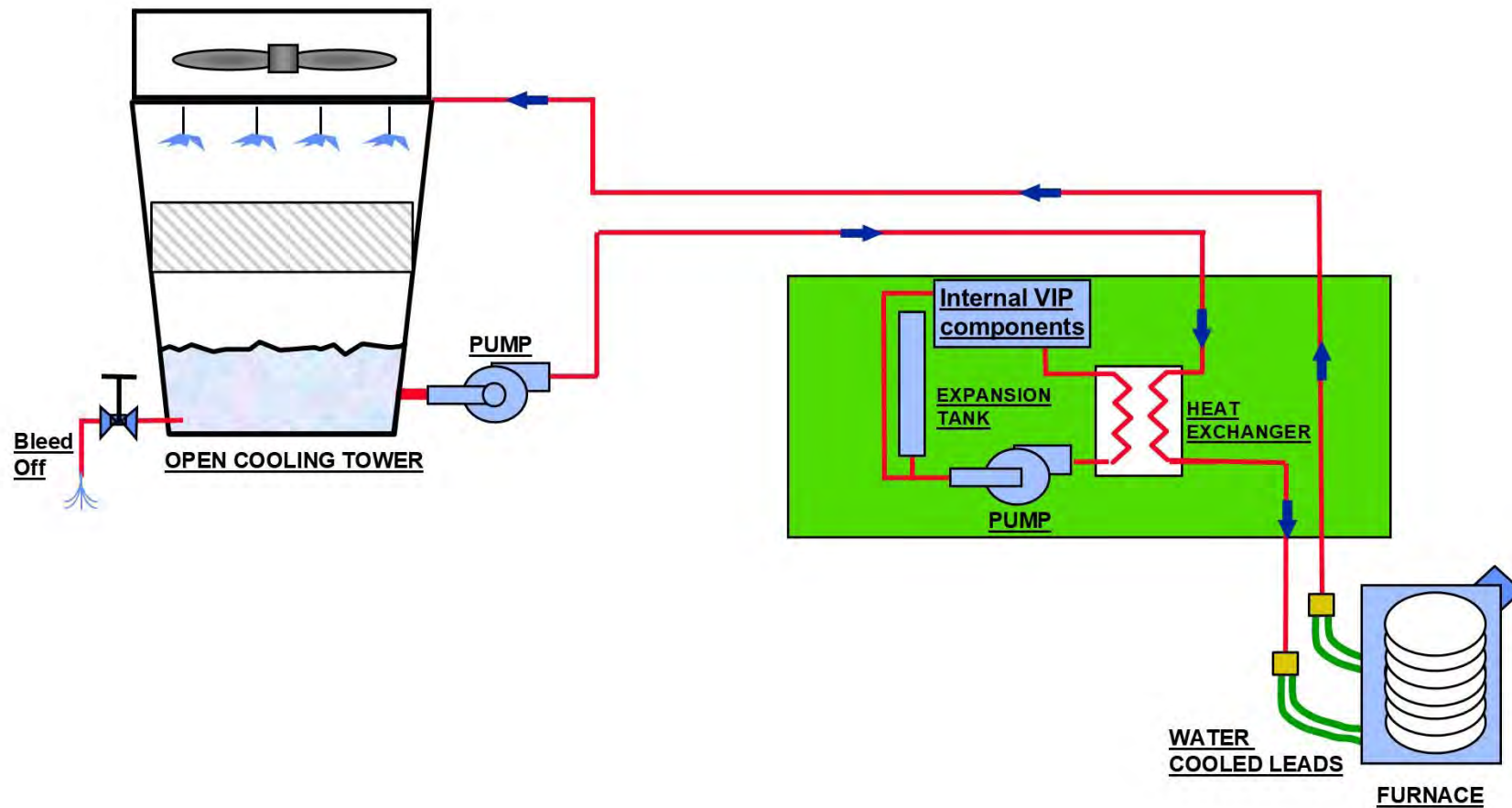
- An explanation of the differences between cooling towers that are most commonly used in Australia and New Zealand.
- An introduction to Adiabatic Coolers
- Metso Case Study

Evaporative Industrial
Cooling Open Tower

An AIR WASHING TOWER



VIP with Internal Cooling System & Open Cooling Tower



A Low cost Evaporative Industrial cooling tower



Open Cooling Tower System (Induction Furnace Cooling)

Inside the tower:

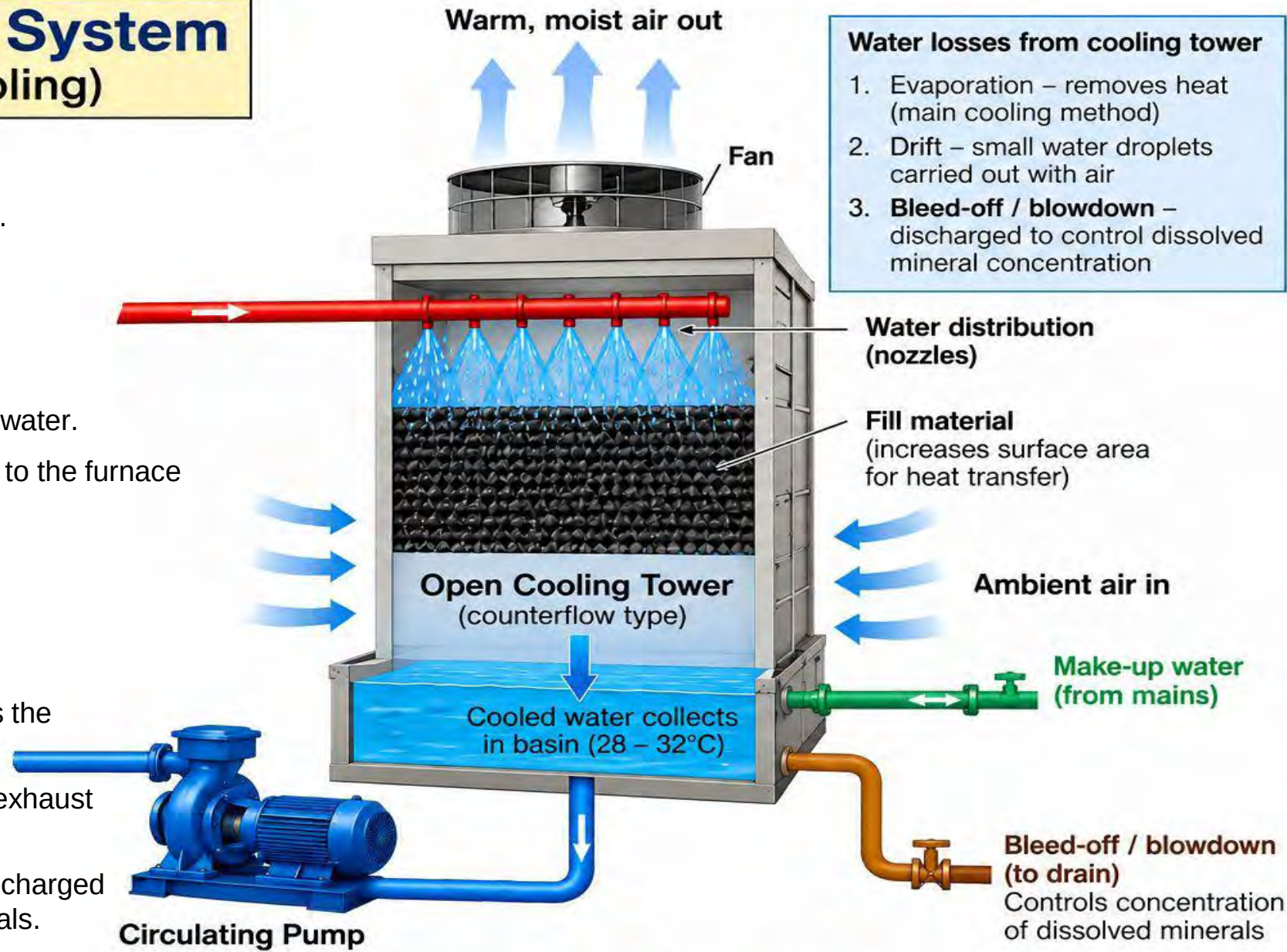
1. Hot water is pumped into the **top of the tower**.
2. It is distributed over the **fill material**.
3. Air is drawn through the tower by the fan.
4. Water **evaporates**.
5. Evaporation removes heat from the remaining water.
6. Cooled water collects in the **basin** and returns to the furnace cooling circuit.

The important point about water consumption

The tower loses water in three main ways:

- **Evaporation** – the water that actually provides the cooling.
- **Drift** – tiny water droplets carried out with the exhaust air.
- **Bleed-off/blowdown** – water is deliberately discharged to control the concentration of dissolved minerals.

Fresh **make-up water** replaces all three.



As water evaporates, the minerals remain behind, so their concentration increases.
The constant water bleed-off to drain prevents the concentration becoming excessive.

Cooling Tower Drift Eliminators

As a general rule of thumb:

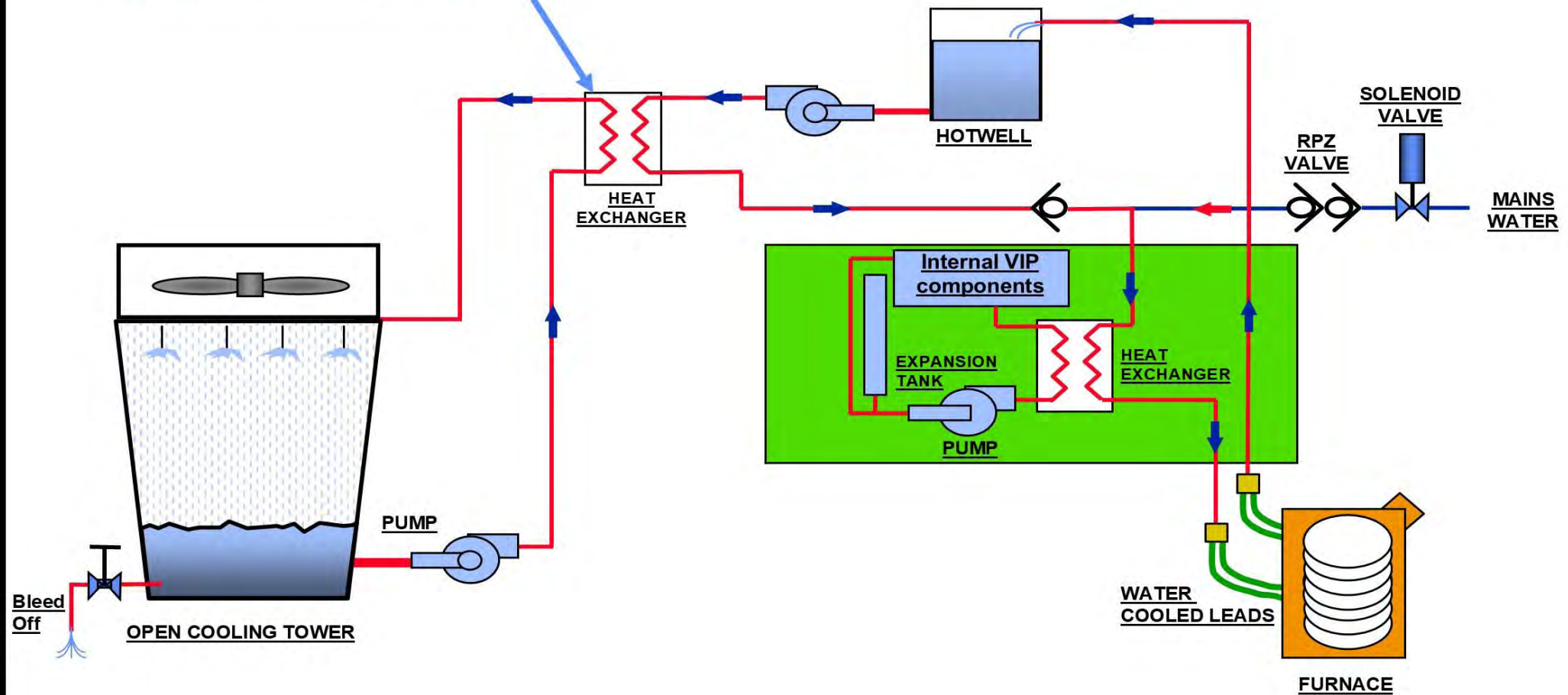
Inductotherm recommends a
bleed off of water at the rate
of:

1 litre per minute for every
100 kW of furnace power

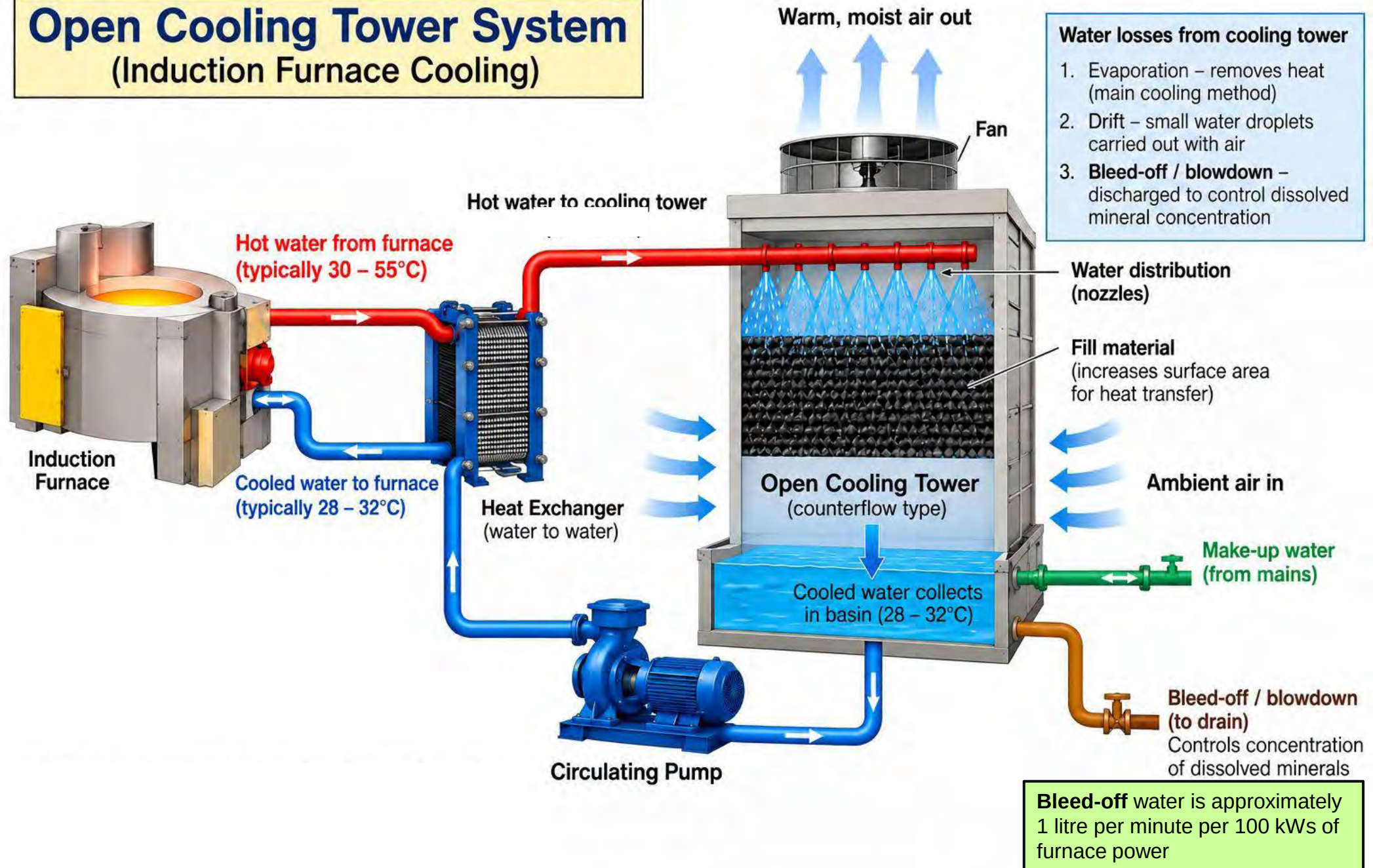


Closed Cooling System with Heat Exchanger & Open Cooling Tower

The Heat Exchanger is added



Open Cooling Tower System (Induction Furnace Cooling)



Open Circuit Industrial
Cooling Tower

HOT WATER IN

COLD WATER
OUT



PLATE FRAME HEAT EXCHANGER added to create a closed system

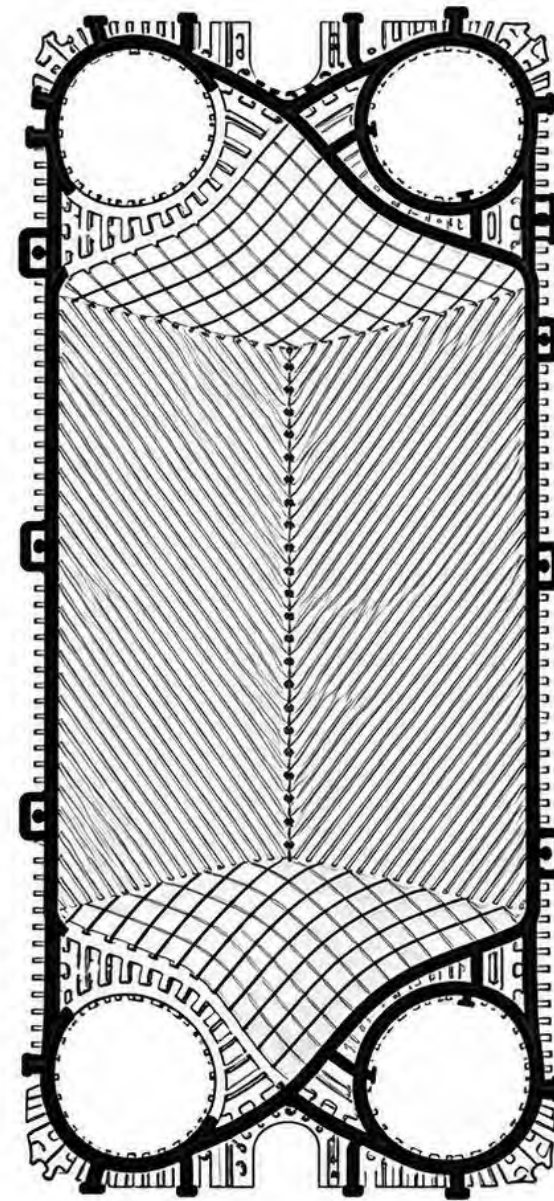


PLATE FRAME HEAT EXCHANGER **Not so easy to clean**

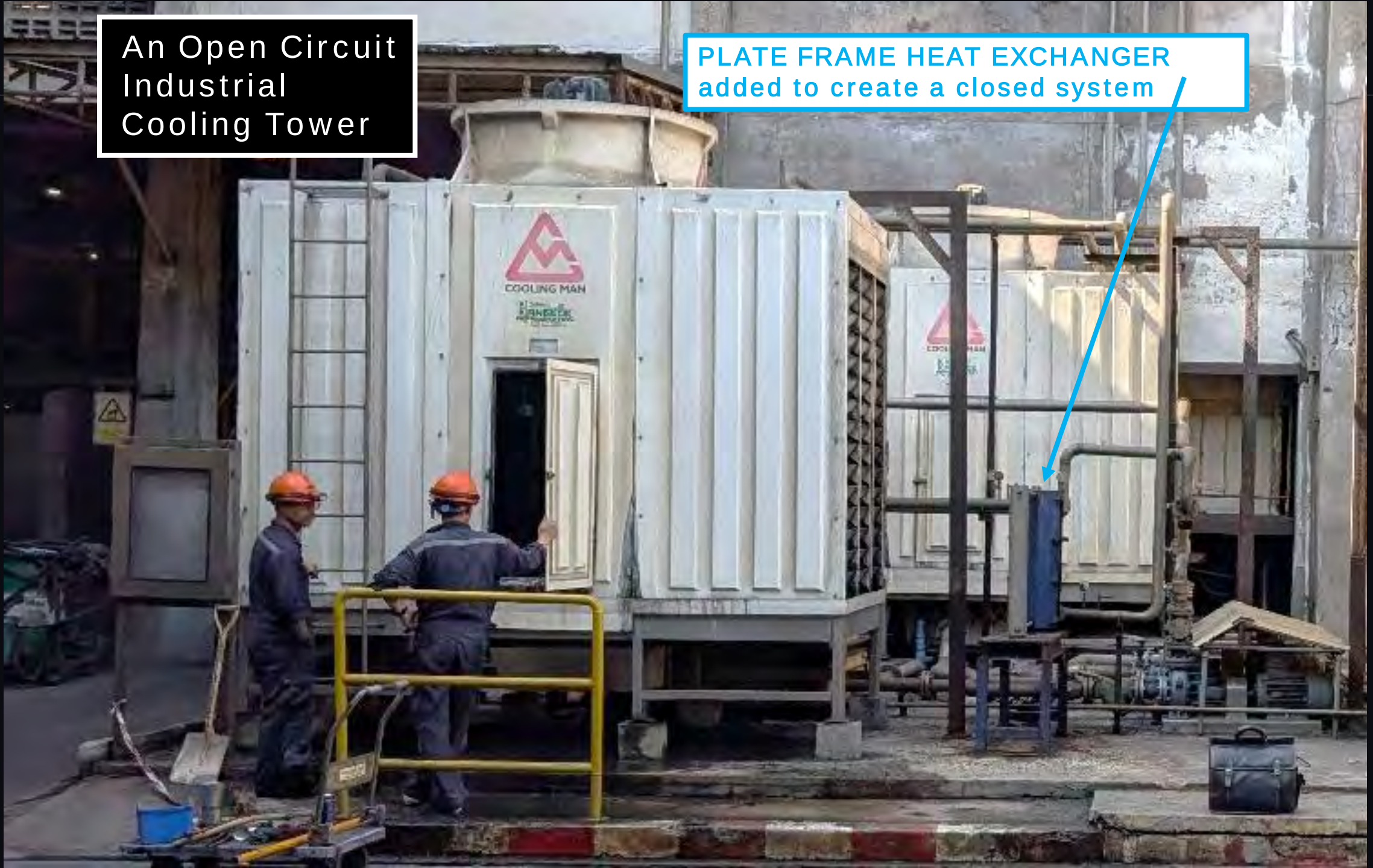
Calcium Buildup on
Heat-exchanger Plates

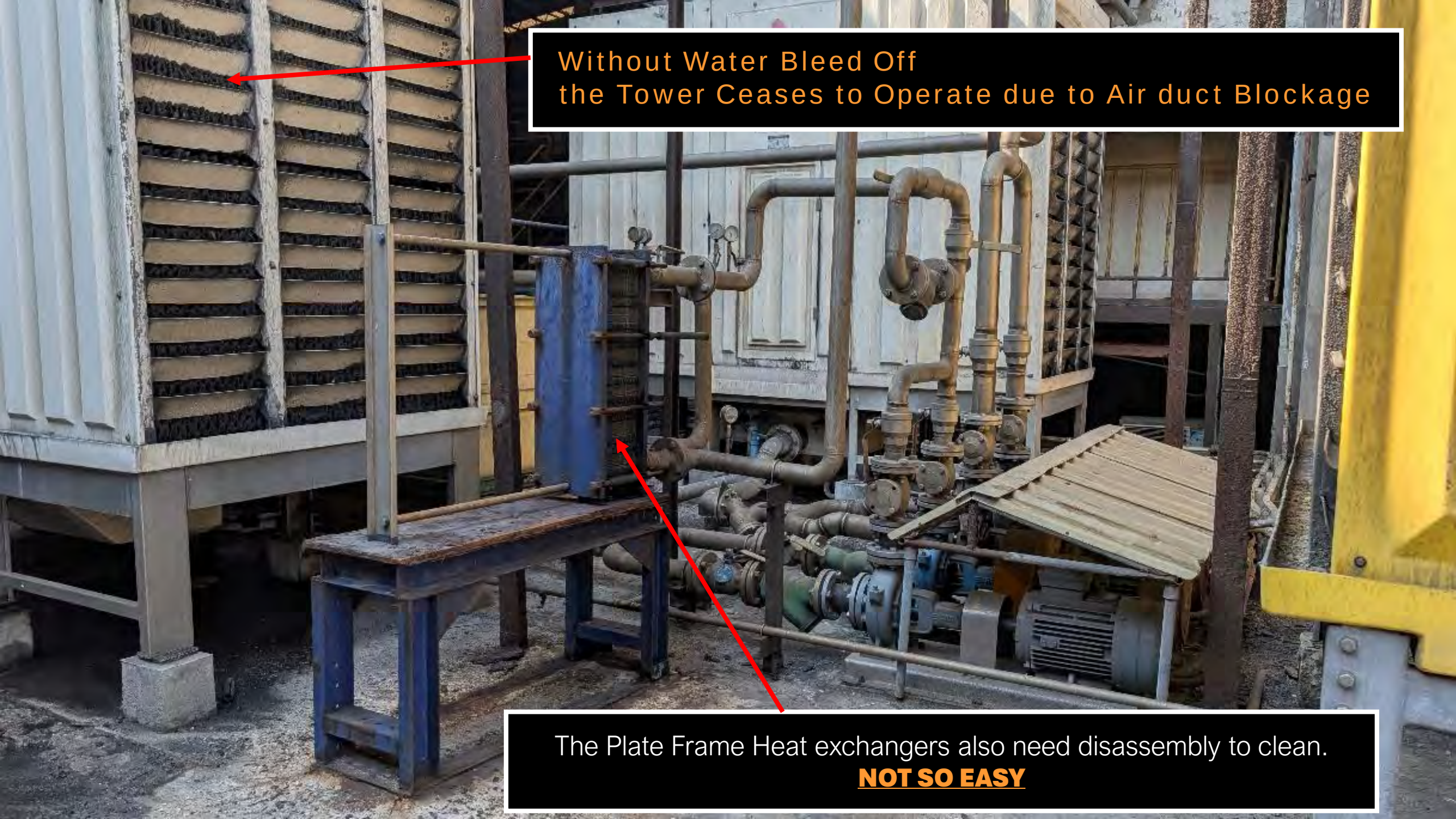
**Not So Easy to
Clean**



An Open Circuit
Industrial
Cooling Tower

PLATE FRAME HEAT EXCHANGER
added to create a closed system



The image shows an industrial setting. On the left is a large, multi-story structure with horizontal slats, likely an air duct. To its right is a complex system of pipes, valves, and a plate frame heat exchanger. A red arrow points from the text box to the air duct. Another red arrow points from the text box to the plate frame heat exchanger. The ground is covered in dirt and debris. A yellow structure is visible on the far right.

Without Water Bleed Off
the Tower Ceases to Operate due to Air duct Blockage

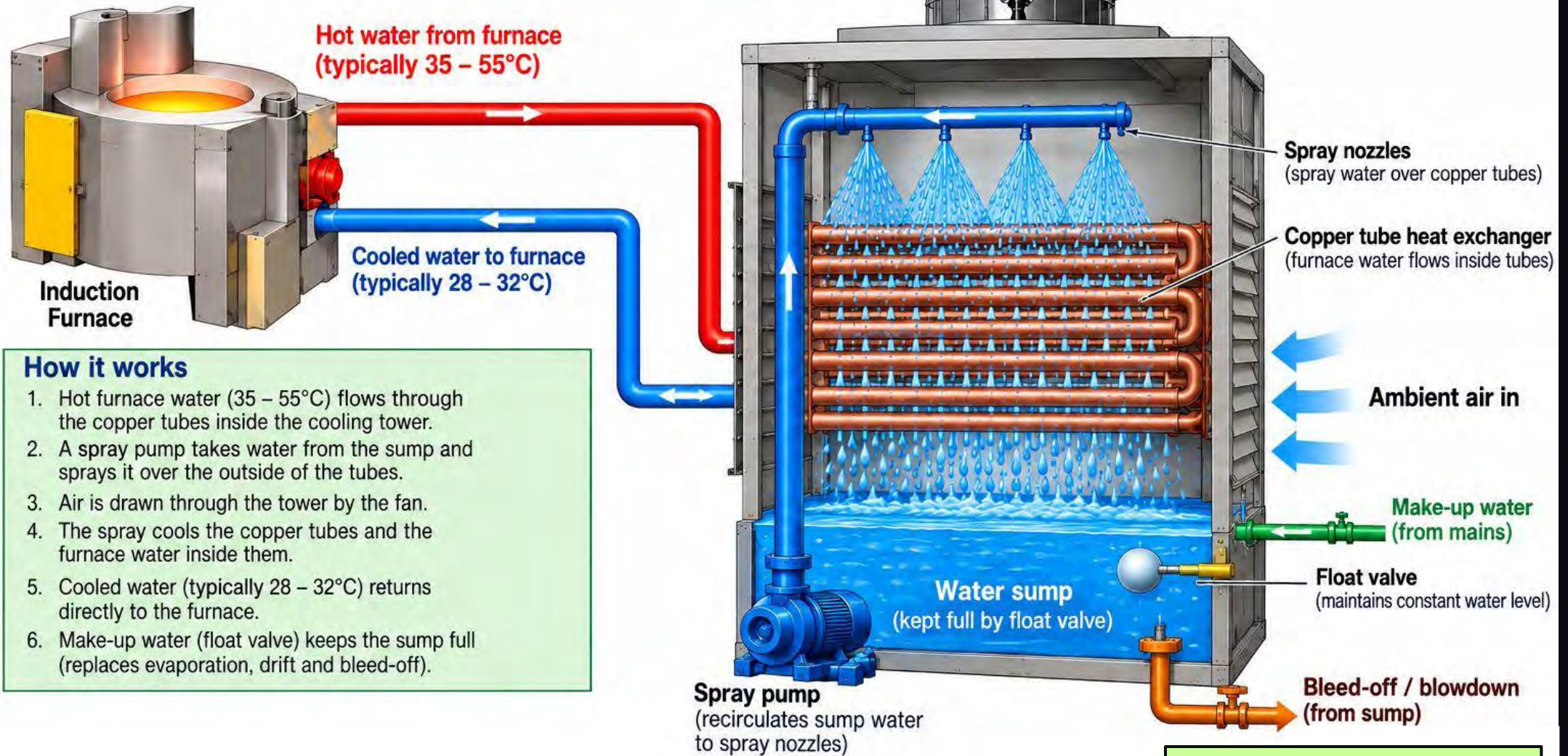
The Plate Frame Heat exchangers also need disassembly to clean.
NOT SO EASY



Spray Type Cooling Tower System

(Copper Tube Heat Exchanger)

(Direct closed-loop cooling of Induction Furnace)

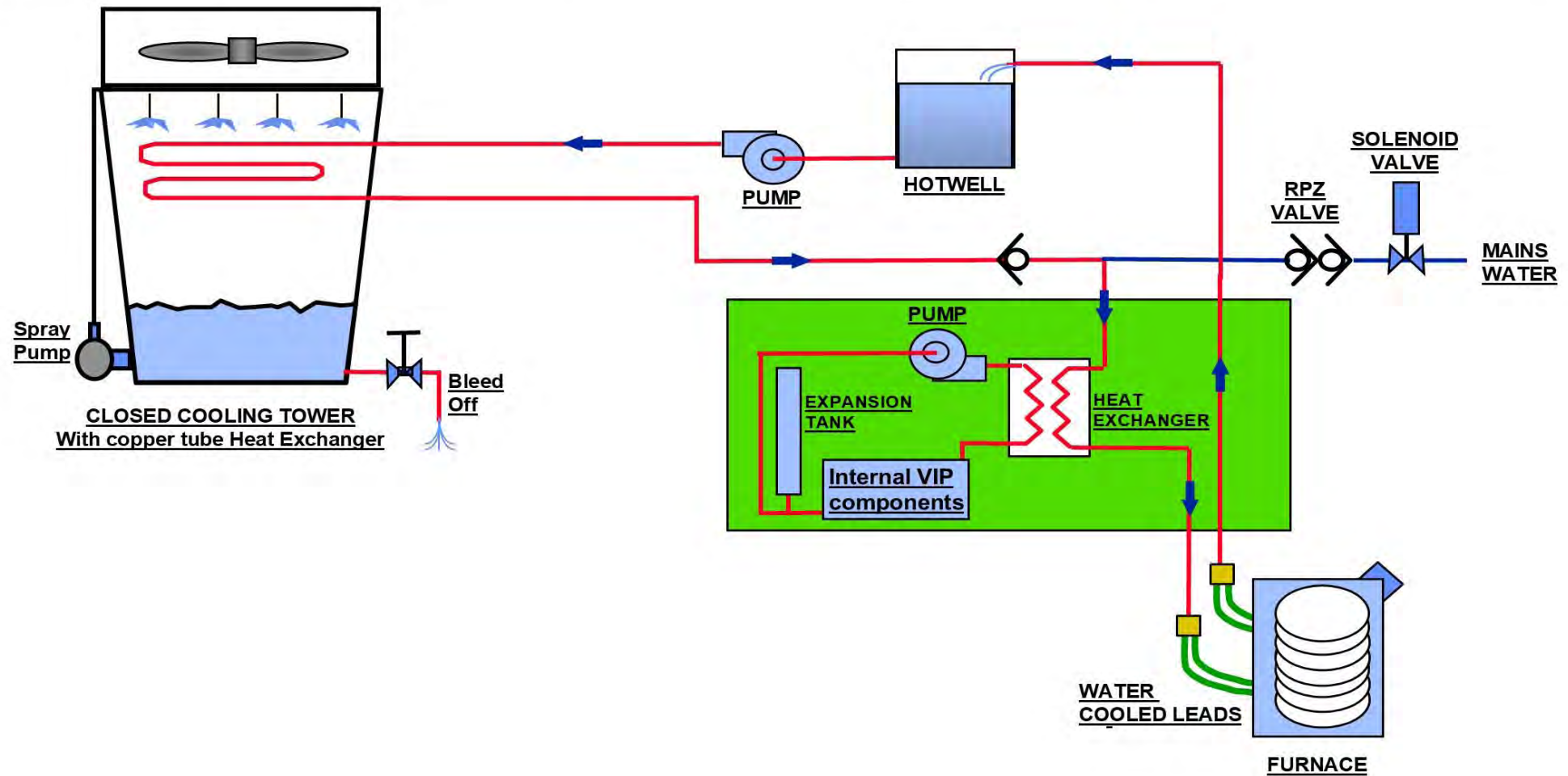


How it works

1. Hot furnace water (35 – 55°C) flows through the copper tubes inside the cooling tower.
2. A spray pump takes water from the sump and sprays it over the outside of the tubes.
3. Air is drawn through the tower by the fan.
4. The spray cools the copper tubes and the furnace water inside them.
5. Cooled water (typically 28 – 32°C) returns directly to the furnace.
6. Make-up water (float valve) keeps the sump full (replaces evaporation, drift and bleed-off).

Bleed-off water is approximately 1 litre per minute per 100 kW of furnace power

Closed Cooling Tower with copper tube heat-exchanger



Closed Circuit Cooling Tower with internal Copper Tube Heat Exchanger

Includes:
Water pumping module



There are substantial fines and legal penalties across Australia for failing to register an industrial or open-water evaporative cooling tower.

Chemical treatment is required to prevent Legionnaires disease.

Ongoing chemical treatment is very expensive

About: Adiabatic Cooling Towers

They are **Virtually Maintenance Free** and have reduce operating and maintenance costs.

Adiabatic cooling towers (both wet and dry type) offer the lowest operating costs and are a recent addition to Inductotherm's standard cooling system designs. These cooling water towers offer minimal operating costs, having low or virtually no water consumption and are without the need of expensive chemicals and chemical monitoring

TOTALLY SAFE FOR HUMAN HEALTH.

There is no stagnation of water and there is no risk of the generation of Legionella.

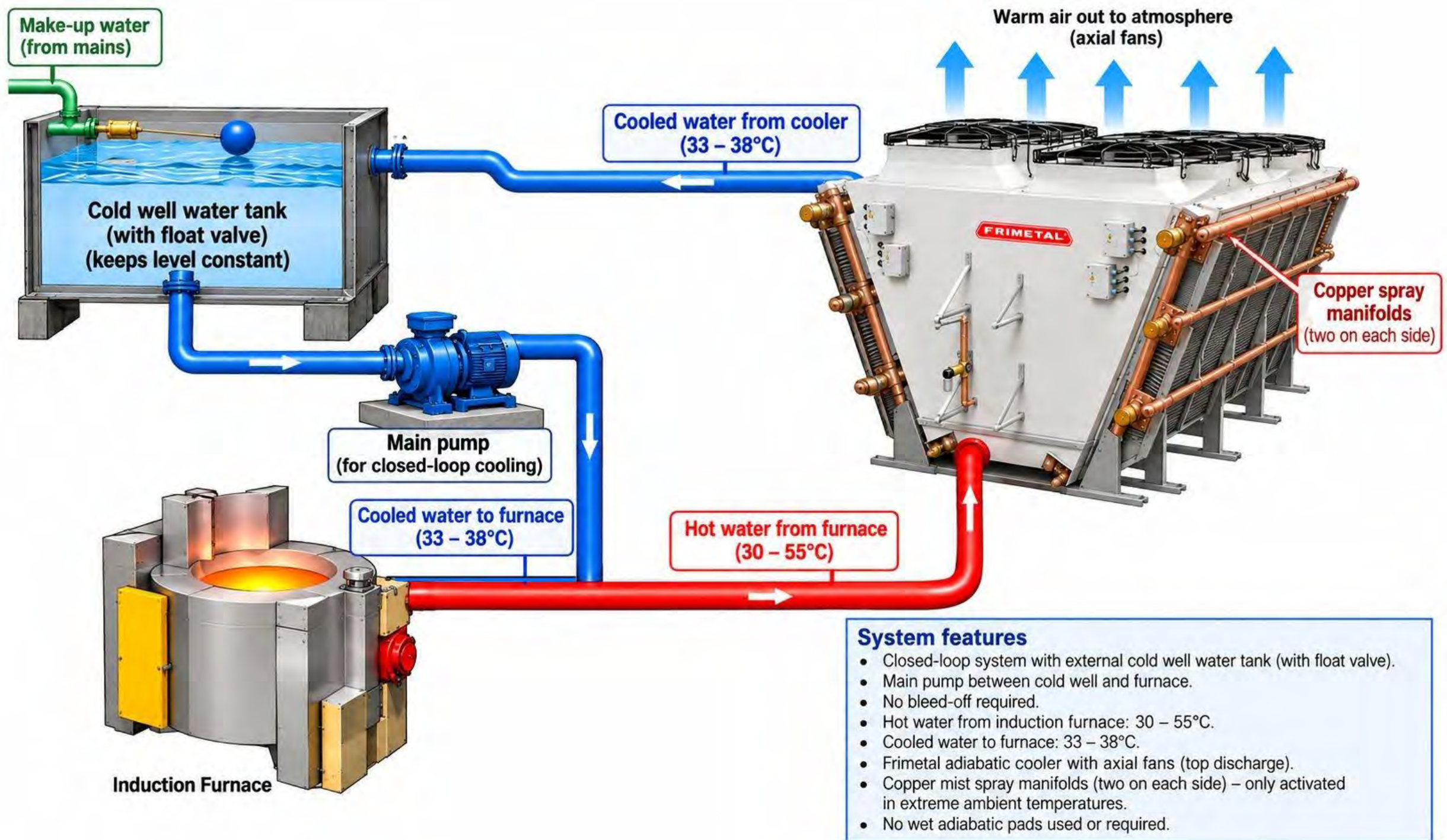
Adiabatic coolers have two Working Modes

"Dry Mode" can be run during most of the year. During this mode, the cooler operates as a dry-cooler with no water consumption. The heat transferred by the water is dissipated in the ambient air by convection, aided by the fans.

"Adiabatic Mode" in adiabatic mode, the mist sprays are automatically activated when there are periods of high ambient temperature when the dry mode is not able to maintain the required outlet water temperature.

Cooling Tower \$ saving are:

- **Low Running Costs**
 - **No chemicals or chemical monitoring required.**
 - **No Registration required for most councils**
 - **Low or no water consumption**



Before and After



Cooling several Induction furnaces in Melbourne Vic.

Before and After

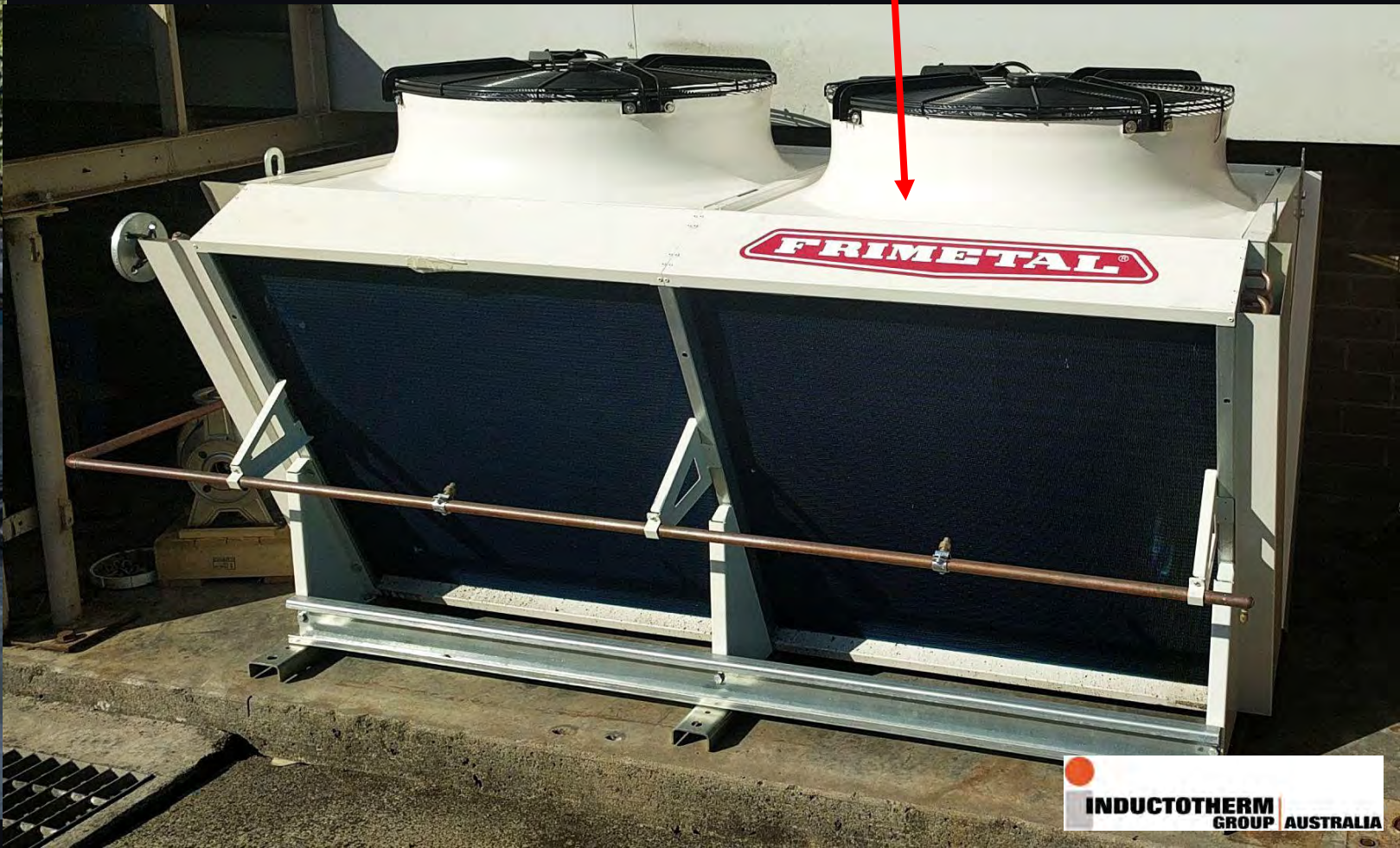


A Newcastle Foundry



Removed a near new 12 month old Evaporative Tower and upgraded to Adiabatic. Customer reported a near 12 month payback.

Before and After



Other Local Foundry Installations



Cooling 30kW Melt
System Qld.



Cooling 50kW Melt
System Victoria
Mounted on a roof



“V” shape 2 fan cooler
NSW
Mounted on a raised deck
when space is limited



2 Fan "V" shaft
At ground level there is a swirl of dust and leaves.
Consider raising the cooler above ground level. An installation in Sydney

pe Cooler Sydney



Five Fan “V” Shape Cooler - Brisbane. This customer has ordered a second 5 fan cooler to suit his expanding melt shop



Compact space saving Six Fan flat vertical Cooler – Castlemaine Vic.



10 Fan "V" shape Cooler QLD 1500 kW Melter.



12 Fan “V” shape Cooler Christchurch NZ cooling multiple Induction furnaces totalling more than 2100 kW



Two Fan Cooler water module for a Victorian Mine site

Metso

Transforming Foundry Cooling

**How Metso Australia Reduced Water
Consumption by 200 kL/month
and
Eliminated Cooling Tower Maintenance**

A real-world case study in foundry induction cooling

Metso Australia Limited • Ballina, NSW

Co-presented with Inductotherm Group Australia



The story in one slide

A cooling-system replacement that changed water, maintenance and operating requirements

200

kL/month

reported reduction in
water consumption

≈200 kL

reported water saving
per month

≈\$3,000

reported monthly
chemical cost
Eliminated

≈20

months

anticipated payback
period

The project replaced cooling towers, chemical treatment and associated maintenance with two dedicated Frimetal adiabatic cooling systems.

What needed cooling?

**Two × 1000 kg
Inductotherm Dura-Line
furnaces**

**750 kW VIP Dual-Trak
power supply**

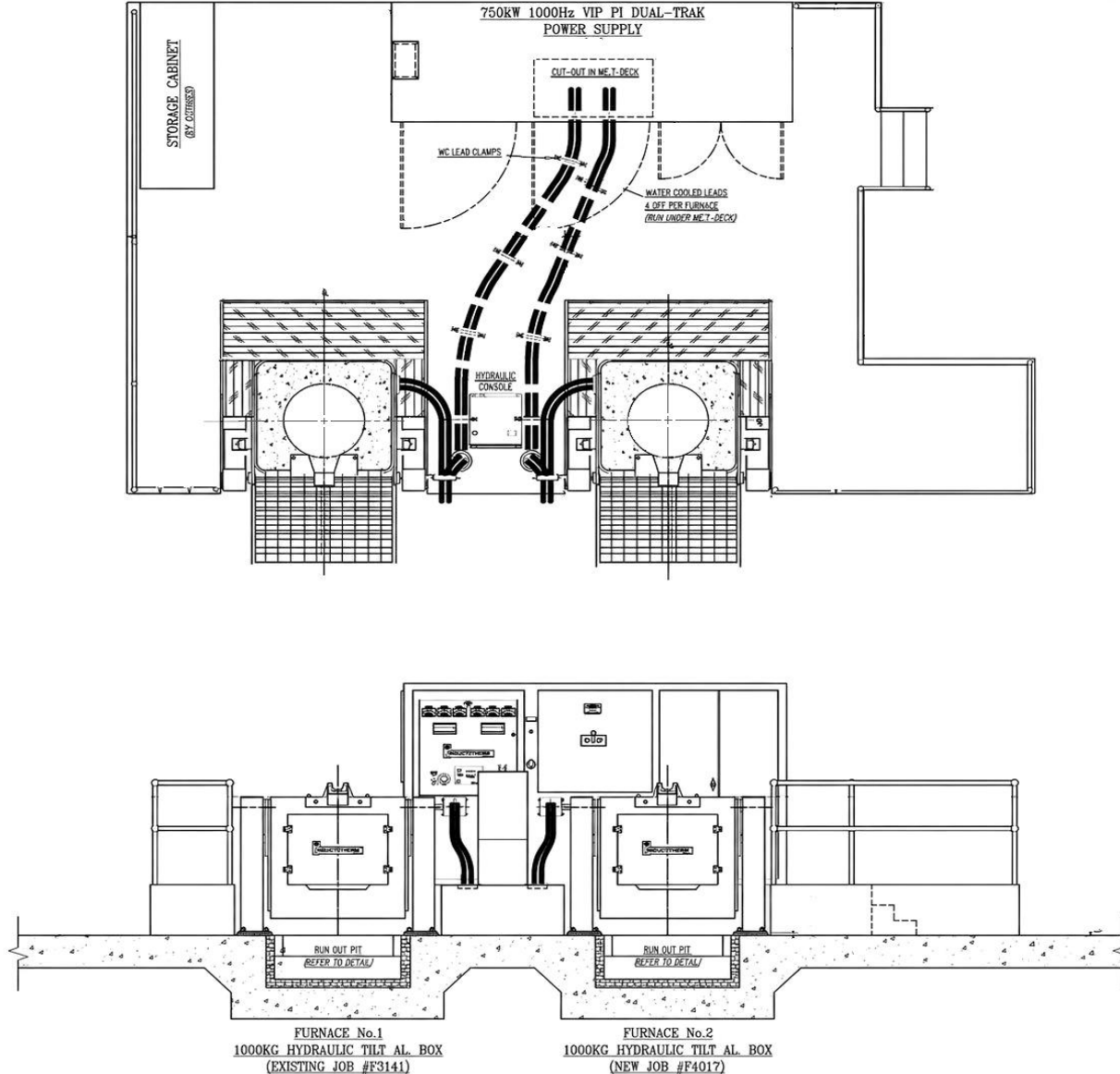
Plus one water-cooled transformer
and one WES Omega
sand cooling system

The cooling requirement is critical to the
operation of the melting and sand systems.

THE LOAD



Equipment Layout



Metso furnace layout — showing the two 1000 kg Inductotherm furnaces and the 750 kW VIP Dual-Trak power supply

Furnace No. 1

1000 kg hydraulic tilt Dura-Line Hydraulic tilt furnace

Furnace No. 2

1000 kg hydraulic tilt Dura-Line Hydraulic tilt furnace

VIP Dual-Trak

750 kW Dual-Trak VIP PI power supply supporting the furnace installation

Reference drawing from the Metso installation documentation.

What Metso had Previously

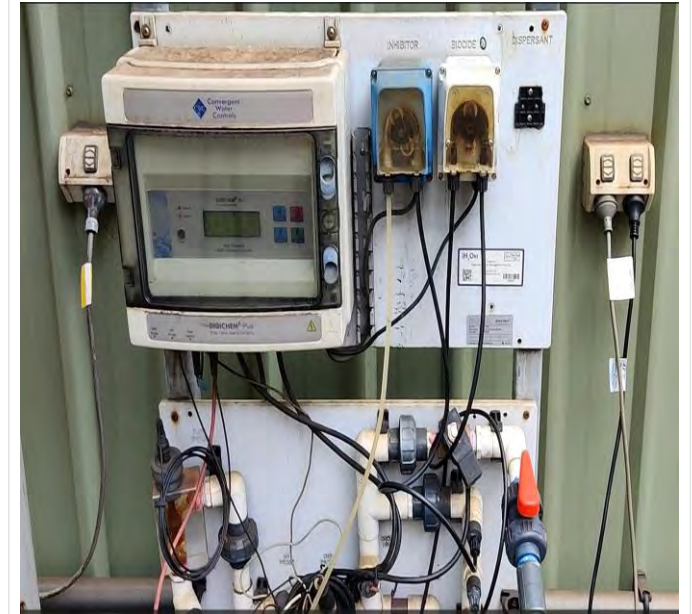
Cooling towers, pumps, filtration and chemical treatment



**Original BAC closed-circuit
cooling tower — removed**



**Original WES sand plant
cooler — removed**



**Chemical dosing system
removed**

The old arrangement required a collection of equipment and ongoing water-treatment management.

The maintenance burden was more than the cooling tower

Examples of equipment and controls that were no longer required



Sand filtration

Associated with the former open cooling-tower /
WES sand cooling arrangement



Original cooling controls

Cooling tower pump, flow monitoring, timer and
chemical-treatment controls

The engineering challenge: two very different cooling circuits

The final system separates electrical-equipment cooling from furnace and sand-plant cooling

ALN-137D

2-fan adiabatic cooler

- 750 kW VIP Dual-Trak power supply
- Water-cooled supply transformer
- Closed deionised / distilled-water circuit
- Dedicated electrical-equipment cooling

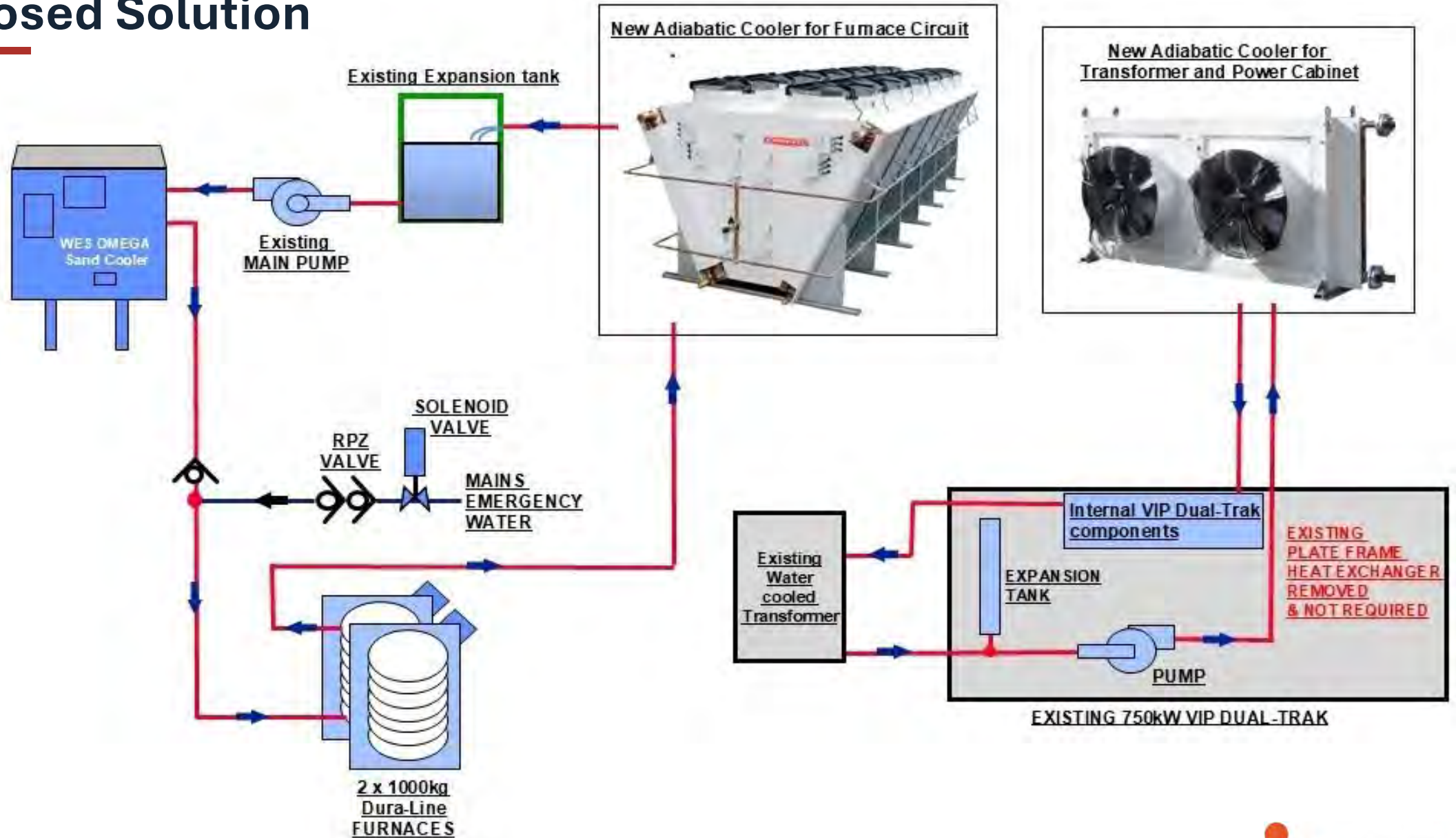
VLN-307D

4-fan adiabatic cooler

- Two × 1000 kg Dura-Line furnaces
- WES Omega sand cooling system
- Tap-water cooling circuit
- Emergency mains-water connection for furnace circuit

The two circuits were designed around their different water-quality and operating requirements.

Proposed Solution



The New Installation

Two Frimetal adiabatic coolers working as one coordinated cooling system



New expansion tank and repositioned pump are also visible.

VLN-307D

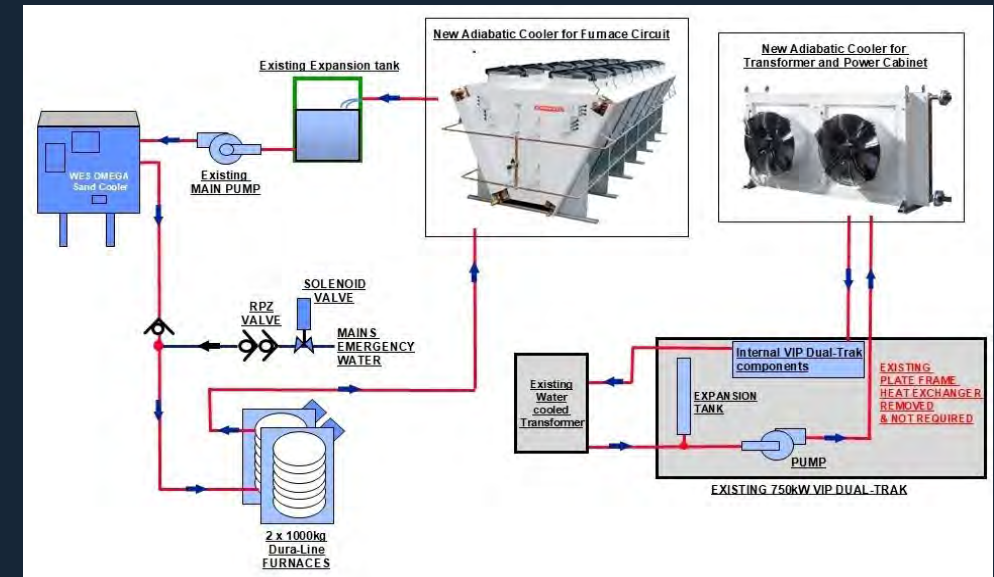
Four-fan unit

Furnaces + WES Omega

ALN-137D

Two-fan unit

VIP Dual-Trak + transformer



VLN-307D — Furnace & Sand Plant Cooling

FOUR FAN “V” Shape ADIABATIC COOLER



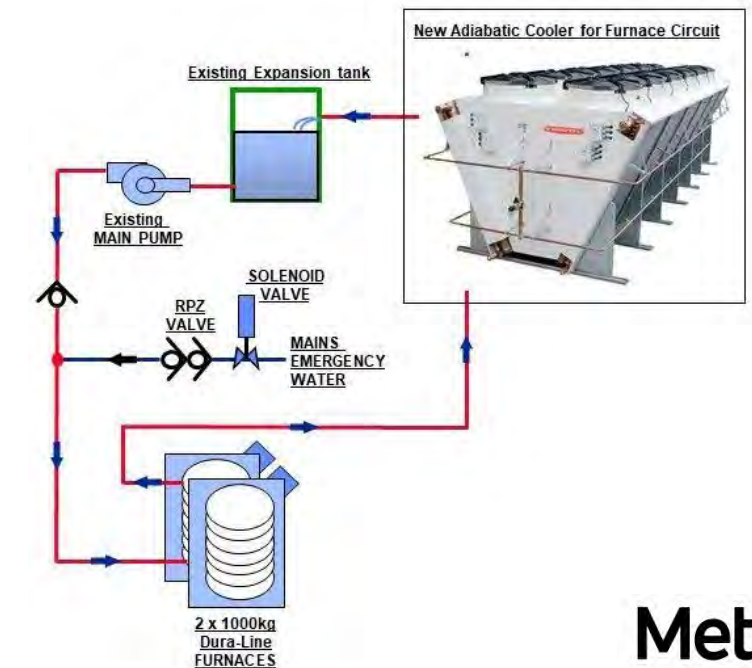
Mist spray manifolds are visible along the sides of both coolers.

For Cooling

- Two × 1000 kg Dura-Line furnaces
- WES Omega sand cooling system

DETAILS

- Four Ø800 mm axial fans
- Dry mode up to 38°C ambient (quotation specification)
- Automatic spray assistance above the specified threshold
- Filled with tap water and fitted with mains water emergency supply



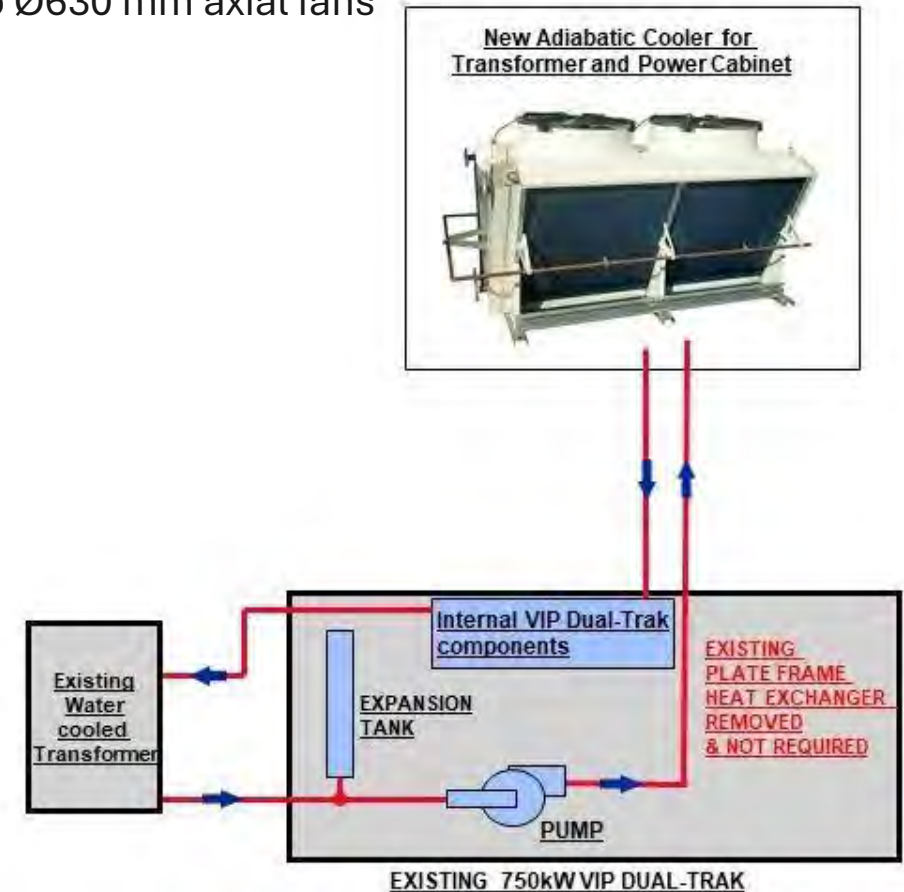
ALN-137D (2 Fan) — VIP Dual-Trak & Transformer Cooling

TWO FAN COMPACT VERTICAL ADIABATIC COOLER



This circuit is kept separate from the furnaces and the sand cooling water.

- 750 kW VIP Dual-Trak power supply
- Water-cooled supply transformer
- Dedicated closed deionised / distilled-water circuit
- Two Ø630 mm axial fans



The process equipment stayed — the cooling changed

WES Omega sand system retained and now cooled by the VLN-307D (4 Fan) along with the furnaces



WES OMEGA

Existing sand system

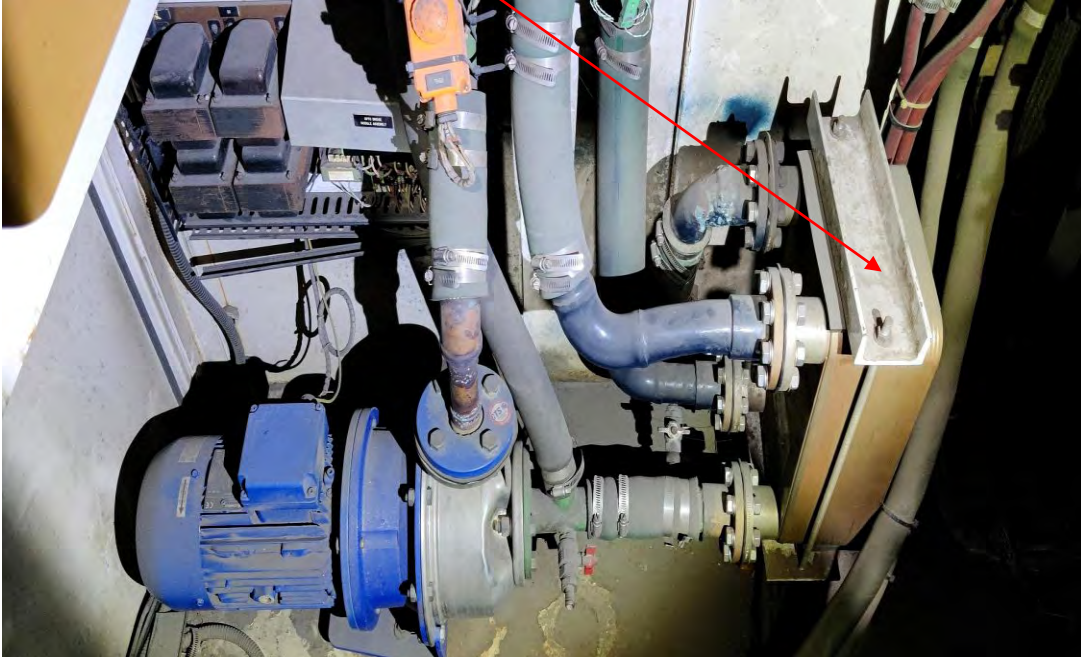
The WES Omega equipment itself was retained. Its cooling arrangement was integrated into the new four-fan adiabatic cooling circuit.

Cooling source

Frimetal VLN-307D

Simplifying the VIP cooling circuit

The internal plate-frame heat exchanger is no longer required.



BEFORE

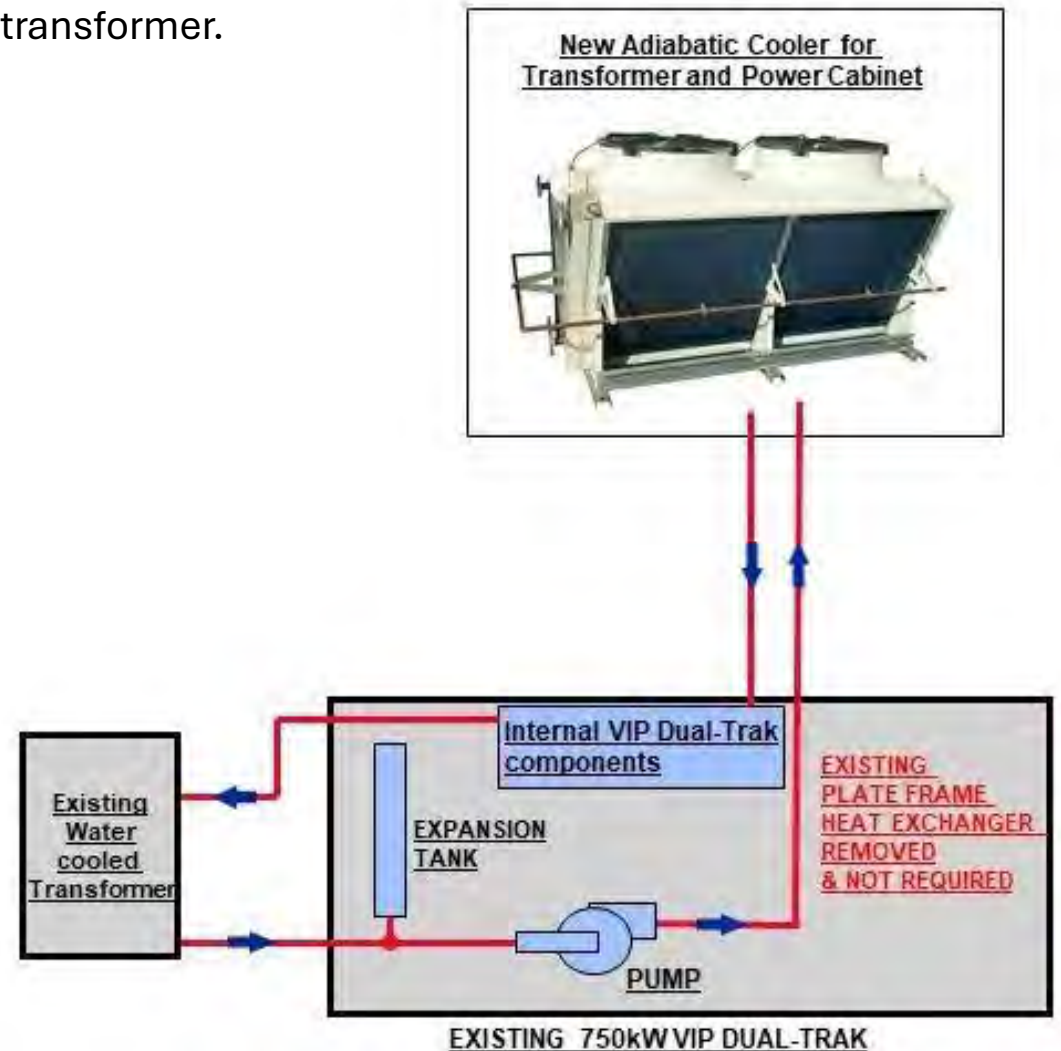
Internal plate-frame heat exchanger

Existing internal pump Dual-Trak cabinet heat-exchanger arrangement as shown above, is removed and not required.

AFTER

Dedicated ALN-137D

Closed deionised-water circuit for the VIP Dual-Trak and transformer.



From continuous wet cooling to intelligent operation

3 MODES: Dry Mode for most conditions; Adiabatic Mode only when extra cooling is needed

1

DRY MODE

Fans reject heat to ambient air.
No spray water is used.

2

TEMPERATURE RISE

Fans stage as cooling demand increases.
The controller responds to water temperature.

3

ADIABATIC MODE

Mist spray is activated when additional cooling is required. This is very rarely activated.

**Automatic spray operation is set to activate when ambient air temperature exceeds 38°C.
Low-pressure spray nozzles activate using normal mains pressure.**

The New Control System

Metso-installed controls supporting the new cooling arrangement



Temperature-based control

- Closed-system water temperature is monitored.
- Furnace control temperature is monitored.
- Fans and sprays are controlled according to cooling demand
- The controller integrates with the customer's cooling controls

The result is a system that operates when cooling is required rather than relying on continuous fan operation.

What changed at Metso?

Customer-reported operational, environmental and financial benefits

WATER

Approximate water
saving is
200 kL/month

CHEMICALS

≈\$3,000/month
eliminated

MAINTENANCE

Chemical dosing,
servicing & basin
cleaning
eliminated

RISK / ADMIN

Legionella
management
and council
requirements
removed

Metso also reported very low operating noise and no operational problems since commissioning.

Customer statement: annual savings were expected to be significant, with an anticipated payback of approximately 18-20 months.

The Customer's Verdict

A practical foundry cooling solution with a strong operational case

“The adiabatic cooling system has proven to be an excellent solution for foundry induction furnace cooling.”

“Since commissioning, no operational problems have been encountered.”

Metso Australia Limited

The only unexpected outcome reported was the system's exceptional efficiency.

From Wet Cooling Towers to Adiabatic Cooling

LESS WATER • LESS CHEMICALS • LESS MAINTENANCE

Two dedicated Frimetal systems now support Metso's induction melting and sand cooling operations.

VLN-307D

4-fan furnace & WES Omega
circuit

ALN-137D

2-fan VIP & transformer
circuit

≈18-20

months

anticipated payback

Water & Sewer Operating Cost Savings

Metso Australia • Ballina, NSW • Replacement of two wet cooling towers with adiabatic coolers

≈ **\$14,250**
annual water & sewer saving

≈ **\$1,188**
average monthly saving

2,400 kL
mains water avoided / year

≈ **\$71,250**
5-year saving

Calculation basis

- Existing wet towers: 200 kL/month
- Annual consumption: 2,400 kL
- Estimated evaporation: 100 kL/month
- Estimated sewer bleed-off: 100 kL/month
- Fixed 50 mm meter/access charges excluded — they remain after the replacement

Annual avoided variable costs

Water	2,400 kL	\$10,867.50
Sewer	1,200 kL	\$3,384.00
Total		≈ \$14,251.50

Note: Based on customer-reported 200 kL/month usage and a 50% sewer discharge assumption. Tariffs should be confirmed with Ballina Shire Council before final commercial use.