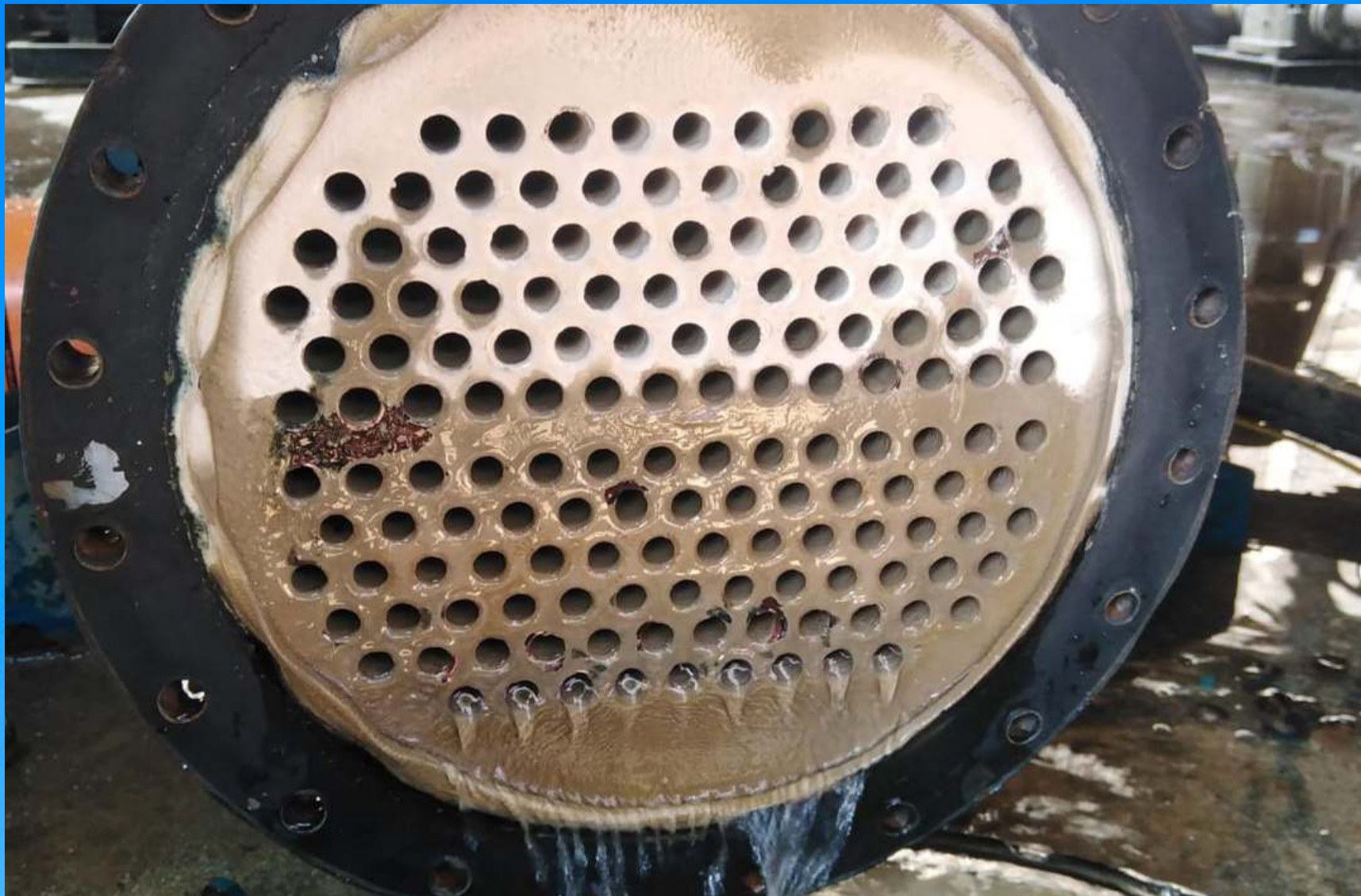


# **CASE STUDY**

## **Condensor Descaling Restores record Milk throughputs at a Kenyan Dairy Plant**



**How a single chemical descaling intervention on a fouled condensor tube bundle unlocked plant capacity, cut refrigeration power draw, and reduced refrigerant losses**

## Client Overview

A mid-sized dairy processing plant in Kenya, producing pasteurised milk, yoghurt, and UHT products for regional distribution, operates an ammonia-based refrigeration system to support pasteurisation cooling, cold storage, and CIP (clean-in-place) chilled water demand. The plant's shell-and-tube condenser rejects heat from the refrigeration circuit to a cooling water loop drawn from an on-site cooling tower.

## The Challenge

Over several years of continuous operation, the condenser accumulated scale — a mix of calcium carbonate, silica, and biological fouling typical of recirculating cooling water systems in Kenyan dairy operations. The fouling layer acted as an insulating barrier on the tube surfaces, degrading heat transfer efficiency.

The knock-on effects were felt across the plant:

- Rising condensing temperature and discharge pressure, forcing compressors to work harder for the same cooling duty
- Milk processing throughput capped below nameplate capacity, as chilling and pasteurisation cooling could not keep pace with production demand
- Elevated electrical power consumption per tonne of milk processed
- Frequent refrigerant top-ups, consistent with slow leakage aggravated by higher system pressures and compressor strain
- Increased maintenance interventions and unplanned compressor trips during peak season production

## At a Glance

|                                                      |                                                      |                                                            |
|------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------|
| <b>+14%</b><br><b>Milk Processing<br/>Throughput</b> | <b>19%</b><br><b>Refrigeration<br/>Power Savings</b> | <b>27%</b><br><b>Refrigerant Top-Up<br/>Cost Reduction</b> |
|------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------|

## Hydrolink Solution

Hydrolink Technologies Ltd was engaged to diagnose and resolve the condenser performance loss. The intervention followed our standard descaling program:

- Scale sampling and deposit analysis (XRF) to characterise the fouling composition and select an appropriately matched chemical cleaning formulation
- Circulation-based chemical descaling of the condenser tube bundle, using an inhibited acid blends-based cleaning solution suited to the copper/steel tube metallurgy and scale type identified
- Controlled dosing, temperature, and contact-time monitoring throughout the cleaning cycle to maximise scale removal while protecting tube integrity
- Post-clean passivation and flush to restore a clean, corrosion-protected heat transfer surface
- Handover of a cooling water treatment program (scale and corrosion inhibitor dosing) to prevent recurrence of fouling going forward

# Results

Following the descaling program, the plant recorded measurable gains across production, energy, and refrigerant costs:

| Parameter                                | Before Descaling       | After Descaling          |
|------------------------------------------|------------------------|--------------------------|
| Milk processing throughput               | Baseline (constrained) | Record high — up 14%     |
| Condenser approach temperature           | Elevated               | Restored to design range |
| Refrigeration compressor power draw      | Baseline               | Down ~19%                |
| Refrigerant top-up frequency/cost        | Baseline               | Down ~27%                |
| Unplanned compressor trips (peak season) | Frequent               | Substantially reduced    |

## **Milk Production Throughput**

With the condenser restored to its design heat transfer efficiency, the refrigeration system could deliver cooling duty on demand rather than lagging behind it. This removed the cooling-side bottleneck that had been capping line speed, allowing the plant to reach a record milk processing throughput.

## **Power and Energy Cost Savings**

A clean condenser rejects heat at a lower approach temperature, which reduces condensing pressure and the corresponding compressor work per unit of refrigeration delivered. The plant recorded a meaningful drop in refrigeration compressor power draw, translating directly into lower electricity costs per tonne of milk processed.

## **Refrigerant Cost Savings**

Lower condensing pressures ease mechanical stress on compressors, seals, and fittings — a common contributor to slow ammonia losses over time. Following the descaling intervention, the plant's refrigerant top-up requirement and associated cost dropped significantly, alongside fewer unplanned maintenance callouts.

## Conclusion

This case illustrates a pattern common across Kenyan dairy plants: fouled heat exchangers quietly erode production capacity and inflate energy and refrigerant costs long before they cause a visible failure. A targeted, correctly formulated chemical descaling program backed by deposit analysis and a follow-on **water treatment regime** — can restore lost capacity and deliver ongoing operating cost savings well beyond the cost of the intervention itself

## About Hydrolink Technologies Limited

Hydrolink Technologies Limited is a water and process treatment company based in Nairobi, serving clients across East Africa in dairy, sugar, beverage, pulp & paper, and industrial manufacturing sectors — covering cooling water, boiler water, process water, and effluent treatment chemistry.

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