MEASURED · REFERENCE INSTALLATION · VIETNAM, VND

VX-LHR — latent heat recovery, single-pass condensing

Avis Foods, Vietnam: single-pass condensing, 8.62 % of the fuel measured

Four gas-fired steam boilers, flue gas leaving at 187 °C, and a fuel meter that settles the argument. We instrumented the plant, ran the baseline, then added a single-pass condensing recovery unit — sensible heat first, latent heat in the same pass — and published the meters. This is our own reference installation, so the numbers are measured, not modelled.

01 · PLANT PROFILE

Plant profile

CUSTOMER

Avis Foods · Vietnam (demo tenant, plant code withheld)

APPLICATION

Food processing · 4 gas-fired steam boilers · single-pass condensing flue-gas recovery

BOILERS

SB-01 2,000 kW · SB-02 3,000 kW · SB-03 4,000 kW · SB-04 6,000 kW — 15,000 kW installed

RECOVERY EQUIPMENT

VX-SHR (sensible) + VX-LHR (condensing) + VX-MV metering, CXL single-pass condensing family

FLUE GAS PATH

187 °C at the boiler outlet → 110 °C after the dry stage → 45 °C after condensing

HEAT SINK

Boiler feedwater and process make-up water, cold enough to take the flue below its dew point

MEASUREMENT

Fuel, steam, flue in/out, water in/out, condensate — 1-minute samples

DATA

Public dashboard · M&V protocol (IPMVP option B)

02 · BASELINE — BEFORE RECOVERY

Baseline — before recovery

Before recovery the flue left the boiler house at 187 °C and went straight to the stack. Nothing was wrong with the plant: the boilers were tuned, the steam load was steady, and the fuel bill was simply what it was. That is the point of a baseline — it is the number the recovery has to beat.

We ran the plant on the existing configuration with the meters live for a full baseline period, so the before-state is a measured record rather than a nameplate assumption. Fuel input, steam output, flue temperature in and out, water in and out, condensate were all sampled once a minute and stored before any recovery equipment was commissioned.

03 · SOLUTION — WHAT WAS INSTALLED

Solution — what was installed

Recovery went in as one pass on the flue path. The **VX-LHR** unit is a single-pass condensing exchanger: the flue gas crosses one bank of tubes and gives up sensible heat to the feedwater on the way in, from 187 °C down to about 110 °C, then drops below its water dew point inside the same pass, where the latent heat of the flue moisture is released and the water itself condenses out, leaving the unit at 45 °C. **VX-MV** meters the whole boundary: fuel, steam, flue temperatures, water in and out, condensate mass flow.

One pass rather than two is enough here only because the plant has a sink cold enough to take the latent heat — condensing needs a return temperature below the dew point, not just a bigger box on the flue.

Sensible part of the pass — VX-SHR

Flue gas 187 → 110 °C, heat into boiler feedwater. Above the dew point no water condenses, so this part alone is what every economizer project already has.

Condensing part of the pass — VX-LHR

Flue gas 110 → 45 °C, same pass, second half of the surface. Latent heat plus the water that condenses out of the flue, metered on the drain so the unit can be proven to be condensing rather than idling.

04 · MEASURED RESULTS

Measured results

Measured on the plant meters across the normal load profile, with the unit running and condensate proven on the drain. One set of readings, expressed in three unit systems.

8.62 %
of the fuel bill saved — measured, single pass

4.07 %
sensible heat — VX-SHR

4.55 %
latent heat and water — VX-LHR

994,650,341 VND
annual fuel saving, measured

MEASURED ON THE PLANT METERS · ONE SET OF READINGS, THREE UNIT SYSTEMS

QUANTITY	Recovered duty
QUANTITY	Recovered duty
UNITED STATES	2,818,769 BTU/h
VIETNAM	826 kW
OTHER (METRIC)	826 kW

UNITED STATES	2,818,769 BTU/h · 2.82 MMBtu/h
VIETNAM	826 kW · 6,609 MWh/yr
OTHER (METRIC)	826 kW · 6,609 MWh/yr

QUANTITY	Flue gas temperature
UNITED STATES	369 → 113 °F
VIETNAM	187.2 → 45.0 °C
OTHER (METRIC)	187.2 → 45.0 °C

QUANTITY	Annual fuel (as saved)
UNITED STATES	281,877 therm
VIETNAM	29,738 GJ · 6,609 MWh
OTHER (METRIC)	23,792 GJ

QUANTITY	Annual saving
UNITED STATES	$37,819
VIETNAM	994,650,341 VND
OTHER (METRIC)	€34,794 · £29,877

QUANTITY	CO_2 avoided
UNITED STATES	107.3 short tons
VIETNAM	97.3 tonnes
OTHER (METRIC)	97.3 t

QUANTITY	Recovered duty
UNITED STATES	**2,818,769 BTU/h**
VIETNAM	**826 kW**
OTHER (METRIC)	**826 kW**

05 · SAVINGS AND PAYBACK

Savings and payback

The saving is reported the way the plant bills: in VND, at the fuel price that appears on the invoice. The dollar and euro columns are conversions at a declared rate (1 USD = 26,300 VND), not a second measurement.

The split inside the pass matters more than the total. 4.07 % of it comes from the sensible part, which is what a conventional economizer would have delivered; the extra 4.55 % exists only because the flue was taken through condensation, and the condensate meter is what proves it.

Payback

This is our own reference installation rather than a customer purchase, so there is no invoiced installed cost to quote and no payback figure on this page. Installed cost for a customer project is quoted per site after the survey — see pricing.

06 · VERIFICATION METHOD

Verification method

Fuel meter and steam meter give the efficiency before and after; flue temperatures and water flow give the recovered duty; condensate mass flow proves the latent stage is running. Everything is sampled once a minute, buffered at the gateway and published, so the percentage can be re-derived by a third party from the raw record instead of being taken from a summary table.

The boundary is IPMVP option B: one measurement boundary around the boiler house, all fuel and all steam inside it. The method is written up in the M&V protocol.

07 · BEFORE AND AFTER

Before and after

BEFORE

187 °C

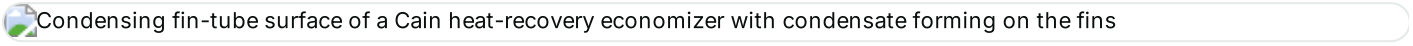
flue gas straight to the stack
fuel bill 100 %

→

AFTER

45 °C

8.62 % less fuel
994,650,341 VND a year


Condensing fin-tube surface of a Cain heat-recovery economizer with condensate forming on the fins

The condensing surface, wet: this is the stage that turns latent heat into a measured number.

Photo: Cain Industries

08 · DOWNLOAD, SOURCES AND WHAT THIS DOCUMENT IS

Download, sources and what this document is

Download case study (PDF) | All case studies

What this document is. Our own instrumented reference installation — real meters, real readings, public dashboard. It is not a customer site and no customer name appears on it.

- PULSE — this plant's own meter record and daily statistics, sampled at one minute.
- PULSE — savings and measurement page for the published method.
- Cain Industries — CXL single-stage condensing series, the equipment family used here.

The 55 °C line: flue-gas dew point | M&V protocol | All case studies