

Utilization of „waste” heat (HRS)

Ing. Jirka Horák, Ph.D.
alias SMOKEMAN

ALMEVA EAST EUROPE a.s.



USEFUL HEAT DOESN'T BELONG IN THE SKY!

80 - 600 °C

30 - 250 °C

HRS a | m e v a

Lower costs. Greater meaning! 😊

SMOKEMAN

DOMESTIC HOT WATER

SPACE HEATING

PREHEATED COMBUSTION AIR

FUEL SAVINGS

CLEANER OPERATION

A MORE SUSTAINABLE TOMORROW

HRS RECOVERING WASTE HEAT

The advertisement features a man in a blue hard hat and yellow cape, pointing towards the viewer. He is standing in front of a brick chimney. A diagram shows the heat recovery process: hot gases (80-600 °C) flow down the chimney, pass through an HRS unit, and then flow up a side duct (30-250 °C). The HRS unit has three outlets: Domestic Hot Water (red), Space Heating (yellow), and Preheated Combustion Air (blue). The background shows a blue sky with clouds.

The aim of the presentation?



➤ So that by the end you will know:

- What an HRS is ?
- How to determine whether an HRS is suitable for you ?
- Who to contact when you want an HRS ?
- Why sometimes actual HRS parameters differ significantly from the design ?
- What can be measured can be improved...

WHO IS ALMEVA?

Safe flue gas solutions for a cleaner tomorrow!

almeva
SWISS GAS FLUE SYSTEMS 

From combustion to a cleaner world



CHIMNEY SYSTEMS
FLUE SYSTEMS
HEAT RECOVERY
ENGINEERING
SUPPORT

almeva

EXPERIENCE
QUALITY
INNOVATION
PEOPLE



**PLASTIC
FLUE SYSTEMS**
PP, PPS, PVDF

**STAINLESS STEEL
FLUE SYSTEMS**
Single and double wall

**HEAT RECOVERY
SYSTEMS (HRS)**
More energy
from flue gases

CHIMNEY SYSTEMS
System solutions
for various fuels

**ACCESSORIES
AND CUSTOM SOLUTIONS**
Complete range
for your project



**30+
YEARS**
OF EXPERIENCE



**CUSTOMERS
IN 30+
COUNTRIES**



**MODERN
PRODUCTION
IN EUROPE**



**A STRONG
PARTNER
FOR YOUR PROJECTS**



**SWISS
QUALITY**

PEOPLE
SOLUTIONS
A CLEANER TOMORROW



Swiss engineering for a sustainable future



RELIABLE AND SAFE SOLUTIONS

For residential, commercial and industrial applications



GREATER ENERGY EFFICIENCY

Heat recovery and sustainable solutions



EXPERT SUPPORT

Technical design, training and customer care



INNOVATION

Modern materials and systems for the energy transition



ACTIVE IN MANY MARKETS

Across Europe and beyond

We are a Swiss production and export company exporting gas flue system components to **23 countries** worldwide with business representation in **18 countries**.



<https://almeva.cz/>

Science
Technology
People

Who is *Smokeman?*

almeva
SWISS GAS FLUE SYSTEMS

Clean air for a better tomorrow



*"Explaining complex things
in a simple way."* 😊

*Experiments
make the invisible
visible!* 😊

**SMOKE
EXPLAINS.
SMOKEMAN
CONNECTS.** 😊



Jirka Horák
a.k.a. **Smokeman**

*"Same guy,
more smoke,
more knowledge!"* 😊



Practical demonstrator

Shows complex technical principles
in a simple and entertaining way.

*Less theory,
more experience!"*



Leader in Royal Rangers (42nd front, Ostrava)

Long-term service with young people.
Camps, outdoor activities, values for life.

*People
matter!"*



Passion for technology and education

Combines technical knowledge with
practical demonstrations and real-world examples.

*Curiosity
drives progress!"*



Committed to a cleaner future

Supports efficient use of energy
and cleaner air for the next generation.

*Clean air.
Brighter futures!"*



Partner of ALMEVA

Helps to communicate the importance of
chimney systems, HRS and real measurements.

*"Technology
makes a difference
– when people
understand it."* 😊



REAL
EXPERIENCES



PEOPLE
AND VALUES



TECHNICAL
KNOW-HOW



A CLEANER
TOMORROW

*More than chimneys.
A cleaner world.* 😊

"If you can see it, you can understand it. If you understand it, you can change it." – Smokeman

**Do you mind the waste in the forest
(Lysá Hora)?**



What will we do with it?
Do you mind the waste heat?



WHAT IS HRS?

*Use the heat,
don't let it
disappear
up the chimney!*

INDUSTRIAL PROCESS

e.g. boiler, furnace,
dryer, kiln, CHP...

1 HOT FLUE GASES
FROM PROCESS
(80 – 600 °C)

2 BYPASS – PART OF
FLUE GASES IS TAKEN
TO HRS

3 REDUCED FLUE GAS
FLOW CONTINUES
TO THE CHIMNEY

HRS

almeva
SWISS GAS FLUE SYSTEMS

COOLED FLUE GASES
FROM HRS
(30 – 250 °C)

HOT WATER
e.g. for process use
or building heating

HEATING
for buildings,
facilities, administration

almeva
SWISS GAS FLUE SYSTEMS

HRS = HEAT RECOVERY SYSTEM

HRS takes a portion of hot flue gases from the process, uses their energy in a heat exchanger and returns the cooled flue gases to the chimney. The recovered heat can be used for hot water, space heating or other technological purposes.



LOWER FLUE GAS
TEMPERATURE



HIGHER OVERALL
EFFICIENCY



LOWER FUEL CONSUMPTION



LOWER CO₂ EMISSIONS



USEFUL HEAT
INSTEAD OF WASTE

*Cleaner air
for a brighter tomorrow!* 😊



ENERGY SAVINGS



SUSTAINABILITY



RESPONSIBILITY
FOR A BETTER TOMORROW

QUESTION No. 1

DO I HAVE A SOURCE OF “WASTE” HEAT?



HOW MUCH IS IT?

- thermal power – MW
- energy – MWh

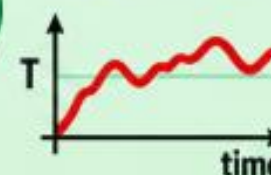


WHAT ARE THE PARAMETERS?

- temperature (e.g. 80 – 600 °C)
- flow rate (m³/h)
- other parameters



WHAT IS THE TIME PROFILE?



- continuous
- intermittent
- seasonal

NO



**HRS IS NOT
FOR ME**

**DO I HAVE A SOURCE
OF “WASTE” HEAT?**

YES



**Continue to
question No. 2**

QUESTION No. 2 CAN I UTILIZE WASTE HEAT?



FLUE GASES
80 – 600 °C

HEAT



COOLING



**REQUIRED
THERMAL POWER**
in kW



**REQUIRED THERMAL
ENERGY**
in MWh (heat and/or cooling)



PARAMETERS
(temperature difference
e.g. 80/60, 50/30 °C ...)



TIME PROFILE
(summer, winter,
week, day ...)

NO

**CAN I UTILIZE
WASTE HEAT?**

YES



**IT IS NOT
FOR ME**



**CONTINUE TO
STEP No. 3**

STEP No.3 CONTACT ALMEVA EAST EUROPE

almeva
EAST EUROPE — Part of ALMEVA Group

*More than
a chimney*

Contact ALMEVA EAST EUROPE (jiri.horak@almeva.cz)
and after getting familiar with your situation we will prepare
a feasibility study including the expected return on investment (ROI)
for HRS (always in an individual way).



CONTACT ALMEVA EAST EUROPE

Jiří Horák
jiri.horak@almeva.cz



FEASIBILITY STUDY

- ✓ technical solution
- ✓ energy savings
- ✓ investment costs
- ✓ expected ROI
- ✓ individual design



YOUR BENEFITS

- ✓ clear figures
- ✓ basis for decision
- ✓ reduced operating costs
- ✓ lower CO₂ emissions
- ✓ more sustainable operation

almeva
— EAST EUROPE —

RECOVERING
WASTE HEAT
FOR A CLEANER
TOMORROW

WE USE HEAT EXCHANGERS
FROM

exodraft
EXPERTS IN HEAT RECOVERY

exodraft



WHAT IS A REASONABLE
RETURN ON INVESTMENT
FOR YOU?



UTILIZATION
OF WASTE HEAT



COST
SAVINGS



LOWER
CO₂ EMISSIONS



A MORE SUSTAINABLE
FUTURE

*Clean air
for a better tomorrow*

WHAT ARE THE “BENEFITS” OF USING HRS?

almeva
EAST EUROPE — | Part of ALMEVA Group

*More than
a chimney*



I ACHIEVE HIGHER EFFICIENCY, SO:



I SAVE MONEY ON UNUSED FUEL

By recovering waste heat, I need less fuel to achieve the same useful output.



Fuel
consumption
before HRS

Fuel
consumption
after HRS

IF I AM IN THE EU ETS,
THEN IN ADDITION:



I SAVE MONEY
ON CO₂ EMISSION
ALLOWANCES

75 EUR/EUA

Lower fuel consumption means lower CO₂ emissions, and therefore lower costs for emission allowances.



Costs
before HRS

Costs
after HRS



I RECEIVE ADDITIONAL
FREE EMISSION
ALLOWANCES

For the waste heat used, I may receive additional free emission allowances according to EU ETS rules.

31.2 EUA/TJ

2340 EUR/TJ



LOWER
OPERATING COSTS



LOWER
CO₂ EMISSIONS



MORE EFFICIENT
USE OF ENERGY



A MORE SUSTAINABLE
TOMORROW

*Cleaner air
for a better tomorrow*

**WHY IS IT
WORTH IT
FOR AN ENGINEER
TO REDUCE
CO₂ EMISSIONS?**

*More than
a chimney*



LOWER SPECIFIC CO₂ EMISSIONS
(tCO₂ per product or per MWh)
= HIGHER PROCESS EFFICIENCY

*Higher efficiency
means
lower emissions!*

SPECIFIC CO₂ EMISSIONS
tCO₂ per product or per MWh



**LOWER EMISSIONS
PER UNIT OUTPUT**

LEADS TO

HIGHER PROCESS EFFICIENCY
More useful energy from the same fuel
or lower fuel consumption



**HIGHER EFFICIENCY
= LOWER COSTS
= LOWER ENVIRONMENTAL IMPACT**



**LOWER
OPERATING COSTS**



**LOWER
CO₂ EMISSIONS**



**MORE EFFICIENT
USE OF RESOURCES**



**A MORE SUSTAINABLE
TOMORROW**

*Cleaner air
for a better tomorrow*

**WHY DO THE REAL
PARAMETERS
(OUTPUT IN kW) OF HRS
SOMETIMES DIFFER
SIGNIFICANTLY FROM
THE DESIGN VALUES?**

Flue gases
(with waste heat)

almeva
- EAST EUROPE -

RECOVERING
WASTE HEAT
FOR A CLEANER
TOMORROW



**BECAUSE THE REAL PARAMETERS
OF THE WASTE HEAT MEDIUM ARE DIFFERENT**



TEMPERATURE



The actual temperature can be higher, lower or more variable than designed.



FLOW RATE



The actual flow rate can differ from the design value and may fluctuate over time.



TIME PROFILE



Operation may be intermittent (day/night, weekday/weekend), seasonal (summer/winter) and not constant as assumed in the design.



COMPOSITION

The medium may contain dust, condensates, corrosive components or other substances that affect heat transfer and the operation of the heat exchanger.



**CAN THIS BE
VERIFIED?**



**YES -
BY MEASUREMENT**



Temperature
measurement



Flow rate
measurement



Long-term
measurement
(time profile)



Flue gas analysis
(composition, dust, etc.)



REAL DATA
REAL SOLUTIONS



EFFICIENT
ENERGY USE



LOWER
CO₂ EMISSIONS



A MORE SUSTAINABLE
TOMORROW

*Cleaner air
for a better tomorrow*



“What can be measured, can be improved.”

– Lord Kelvin (1824–1907)



WITHOUT MEASUREMENT

WE DO NOT KNOW – SO WE CANNOT IMPROVE



WITH MEASUREMENT

WE KNOW – SO WE CAN IMPROVE



1. MEASURE

Determine the current status.



2. ANALYZE

Evaluate the data and identify the causes (e.g., losses, inefficiencies).



3. DESIGN

Propose measures with the greatest benefit.

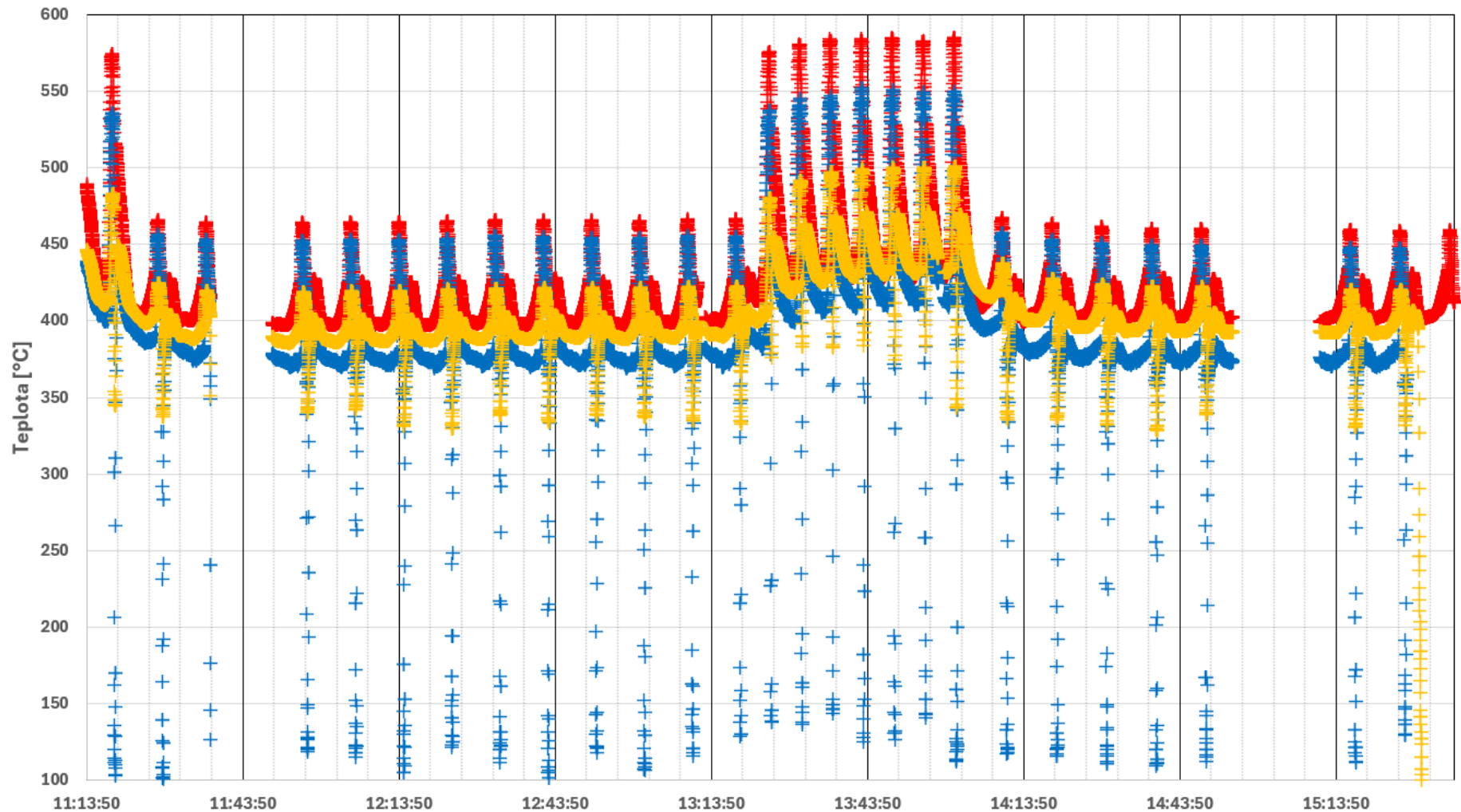


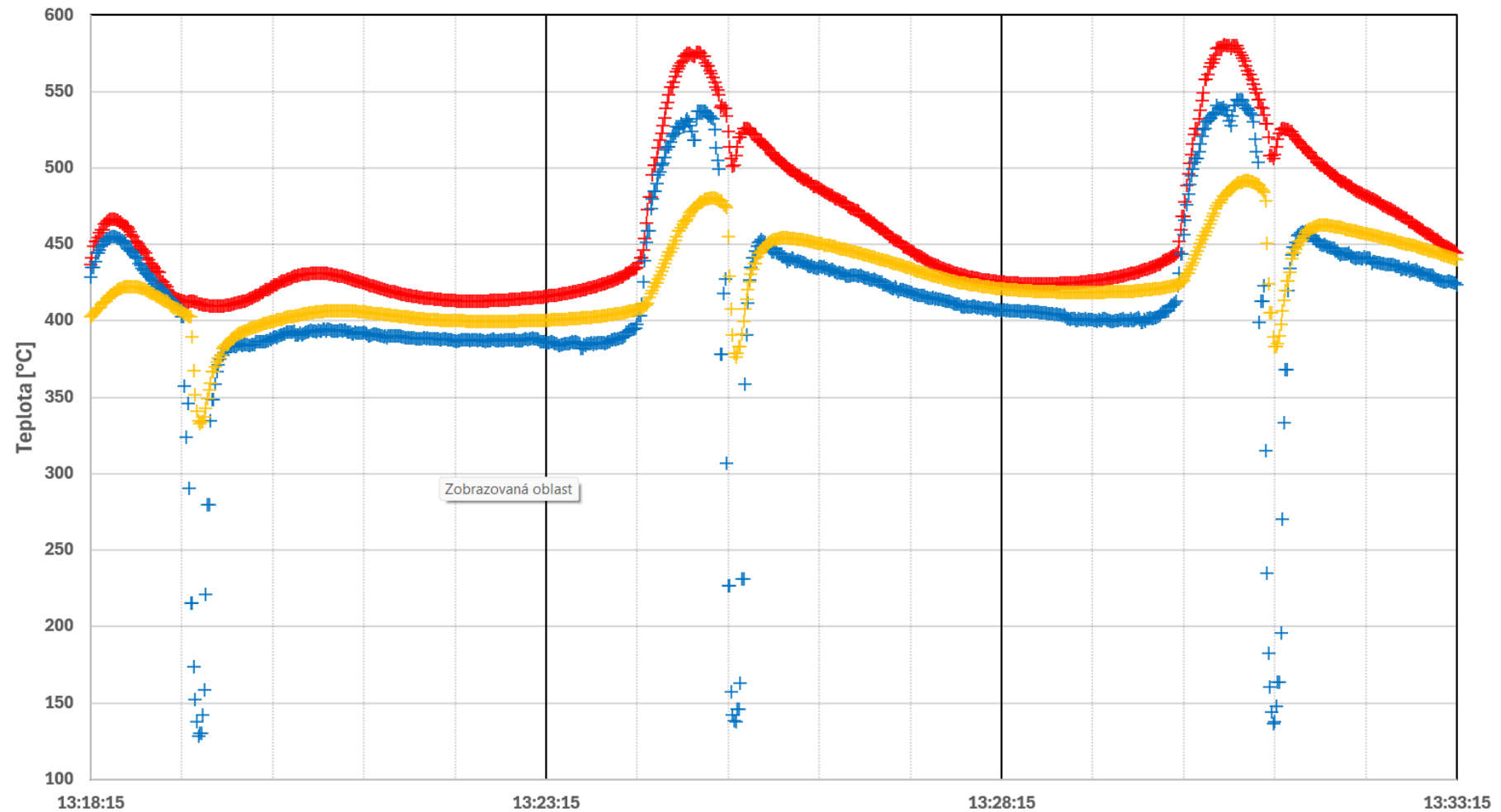
4. IMPROVE

Implement the changes and monitor the results.



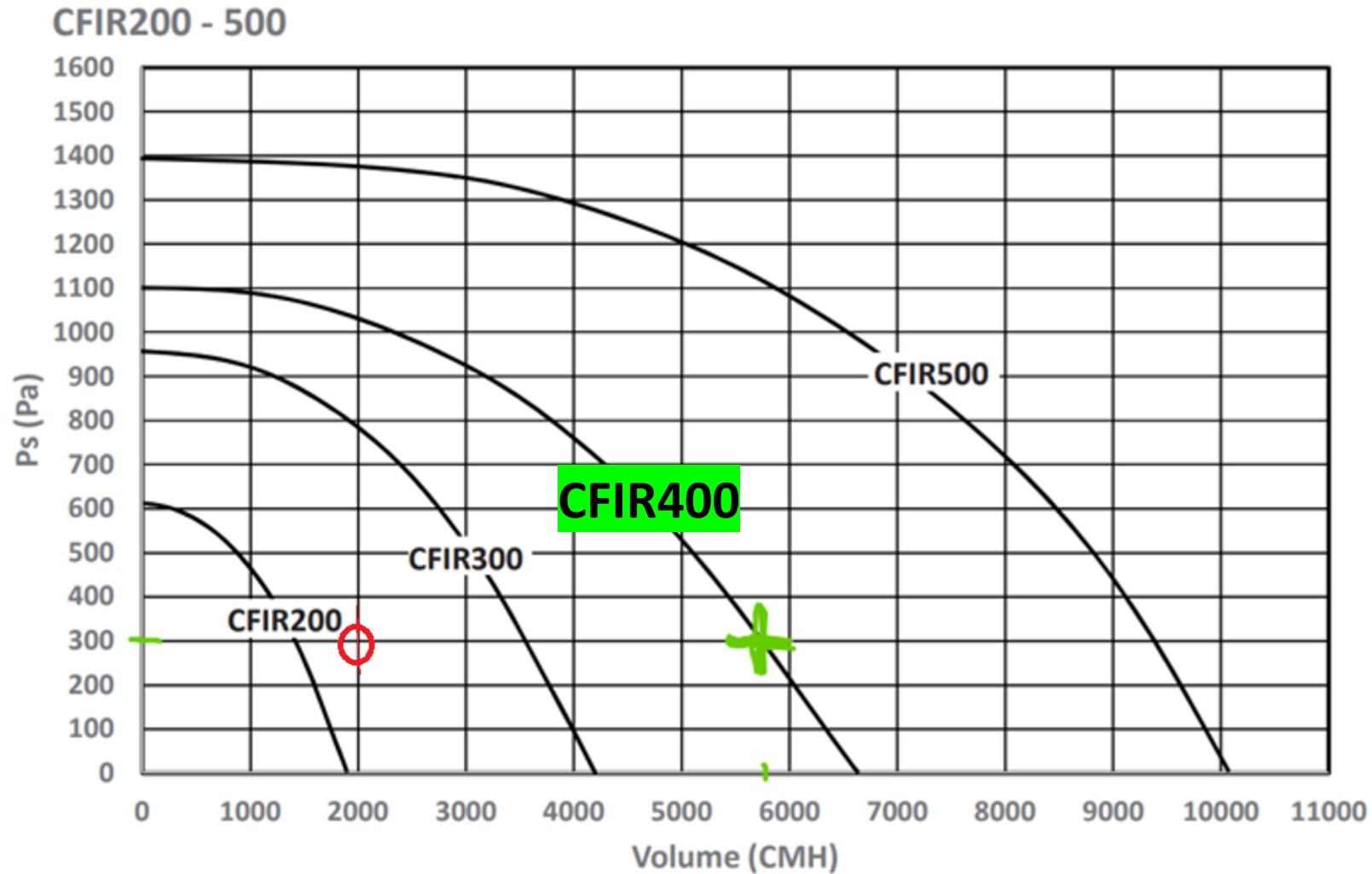








Why is the actual flow only 30% ?



Measure
Understand
Improve

What did we find out?

almeva
SWISS GAS FLUE SYSTEMS 

From data to real savings



MEASURE



ANALYZE



IMPROVE

*"What can be
measured
can be improved."
— Lord Kelvin*

*Data
reveals
the truth!*

1



The fan was running only at 30% of its speed – why?



2



The flue gas flow rate and temperature in the project specification correspond to the conditions behind the catalyst.



3



The HRS carries less than half the flue gas flow, therefore it has only half of the thermal output.



4



This represents an unused saving of approximately 70,000 EUR per year.

**~70,000 EUR
per year**

5



If the flue gases are cooled down to 100 °C, the output increases by a further approximately 30%.



6



A new HRS does not make sense, it is sufficient to optimize the existing one...

*Optimize
instead of replace!*



LOWER
ENERGY COSTS



LOWER
EMISSIONS



HIGHER
EFFICIENCY



A MORE
SUSTAINABLE FUTURE

**Same equipment.
Greater results.**

THE NUMBERS OFTEN SURPRISE US!

vegetable drying plant 500 KW























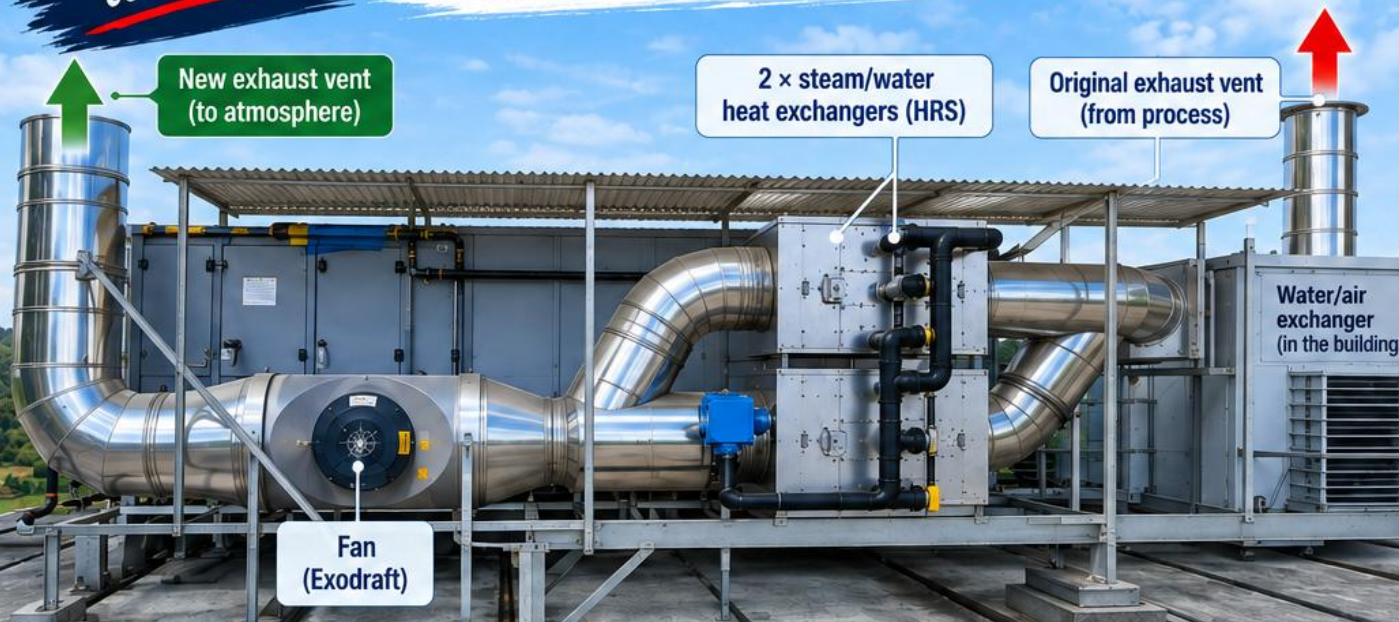
From
waste heat
to value!

HRS – Technical Parameters

Example: Vegetable dryer – heat recovery in practice

almeva
SWISS GAS FLUE SYSTEMS 

Clean air for a better tomorrow



Key technical parameters



Thermal output (recovered heat)

500 kW

≈ 500 kWh of heat per hour



Share of energy from condensation

> 90 %

of the recovered heat comes from
condensing water vapour



Use of recovered heat

**Heating of process air
for vegetable drying**



Main components

- 2 x steam/water heat exchangers
- Fan (Exodraft)
- Duct system
- New exhaust vent



Payback period

≈ 3.5 years

without additional savings from
optimisation of production lines

How it works

Hot flue gas
from process
(steam from blanching)



Cooled flue gas
to atmosphere

Recovered heat
(heating water)

Process air heating
(for vegetable drying)



Application

**Vegetable dryer
(food industry)**



LOWER
ENERGY COSTS



LOWER
EMISSIONS



HIGHER
EFFICIENCY

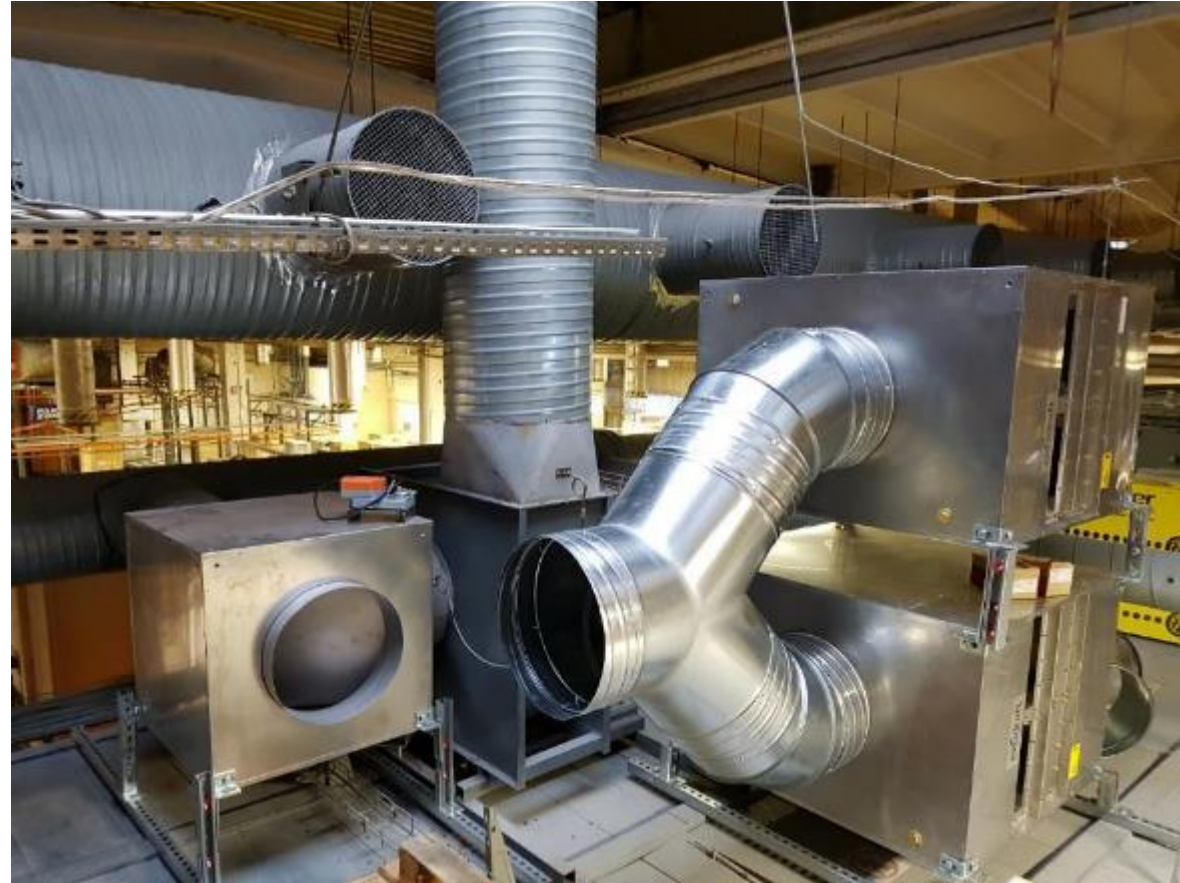


SUSTAINABLE
PRODUCTION

*More than chimneys.
A cleaner world.*



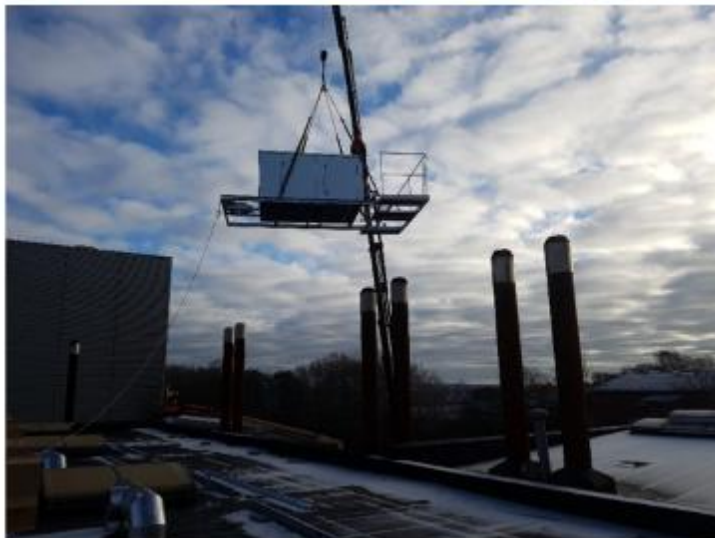
Installation



Installation



Installation



Installation



List of references



https://almeva.swiss/sites/default/files/perm/document/reference_list_hrs_en.pdf

Country	Client	Type of industry
Austria	Comploj	Glass Manufacturing
France	Boehli	Baking Ovens
Germany	WBACK Leipzig	Baking Industry
Latvia	Latvias maiznieks	Bakery
Lithuania	Lietuvos kepėjas	Bakery
Poland	Automotive Manufacturer	Metal Painting Line
Slovakia	MEDEKO SK	FE Metalurg
France	Boehli	Baking Ovens
Germany	Bäckerei Tackmann	Bakery
Germany	Baalk Backbord	Bakery
Germany	Großbäckerei Bahlse	Bakery
Germany	Bäckerei Schwichtenberger	Bakery
Germany	Bäckerei Stehle	Bakery
Germany	Bäckerei Tackmann	Bakery
Germany	Bäckerei Licht	Bakery
Germany	XOX Snack Lauenau	Snack Production
Germany	Bäckerei Kirsamer	Bakery
Germany	Bäckerei Kadatz	Bakery
Germany	Bäckerei Hovng	Bakery

Did I meet the objectives of my presentation?



➤ Do you know:

- What an HRS is ?
- How to determine whether an HRS is suitable for you ?
- Who to contact when you want an HRS ?
- Why sometimes actual HRS parameters differ significantly from the design ?
- What can be measured can be improved...

Exhaust gas extraction systems - ALMEVA



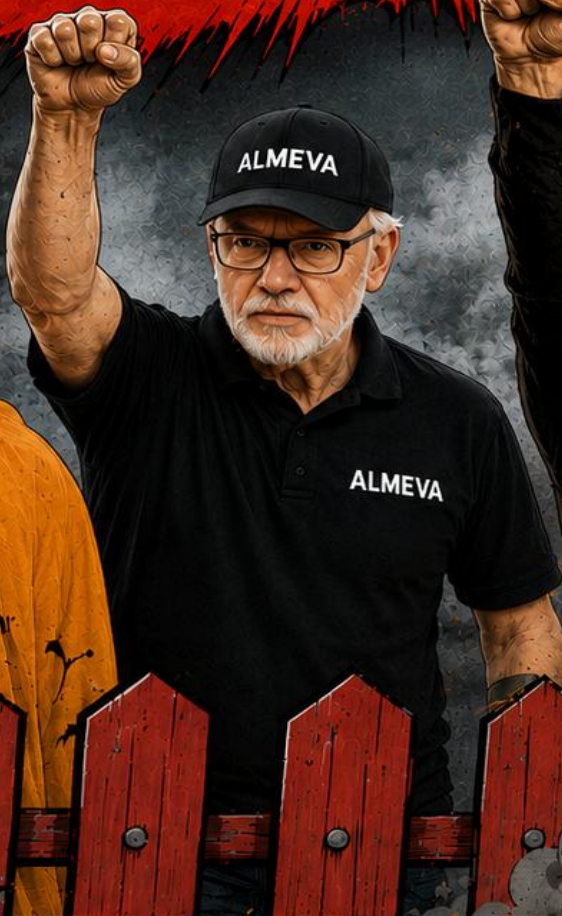
PROFIL ALMEVA



KOUŘÍ I VÁLCE ZMAR!



**SMOKE OUT,
PEACE IN!**



ALMEVA



✓ ČISTÉ KOMÍNY
BEZ KOMPROMISŮ

✓ ŠVÝCARSKÁ
KVALITA

✓ DESIGN,
KTERÝ FUNGUJE



ODVOD SPALIN
S JISTOTOU



BEZPEČNOST
NA PRVNÍM MÍSTĚ



ÚČINNOST,
KTEROU POZNÁTE



ŘEŠENÍ
NA MÍRU



almeva.cz