Cibus Tec 28 October 2026

The TOMATO conference news

When every kWh counts: How tomato processors can reduce costs and increase resilience*

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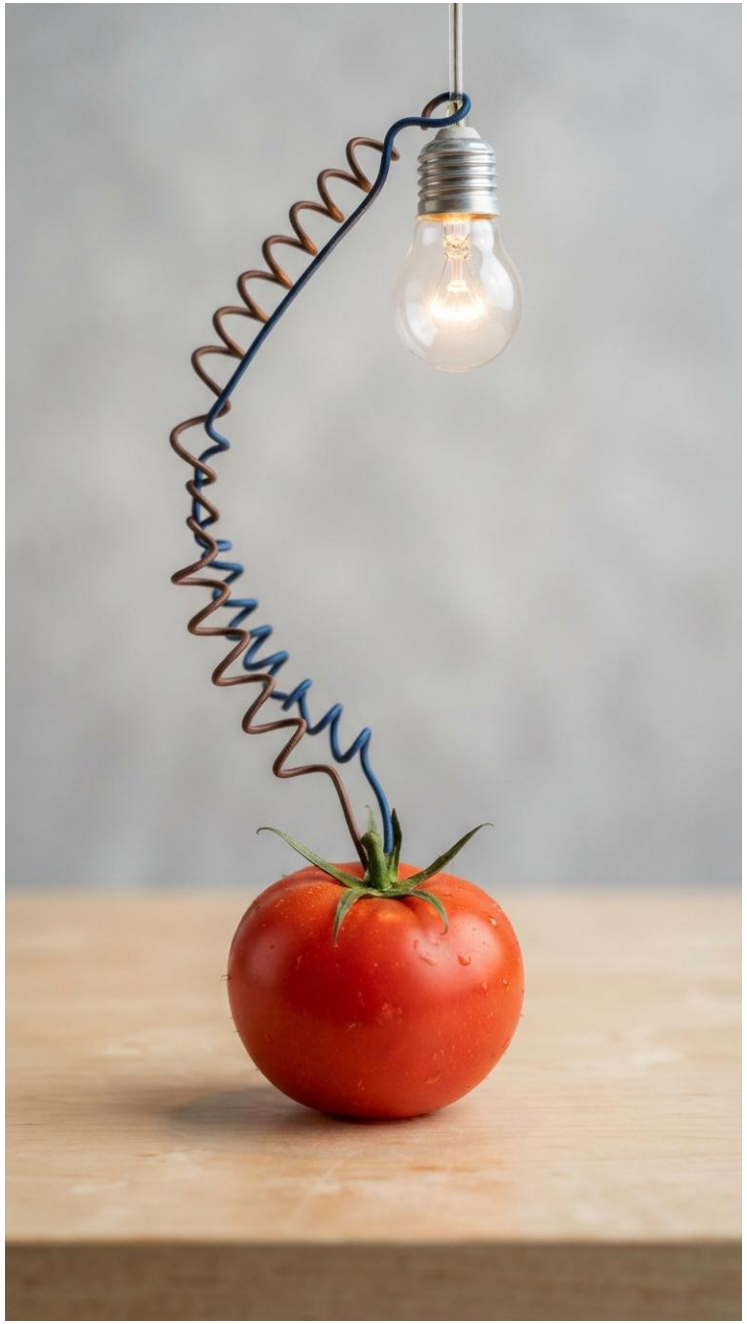
(*) simplified version for distribution. Feel free to contact us for more insight.

MG foodtech ENGINEERING

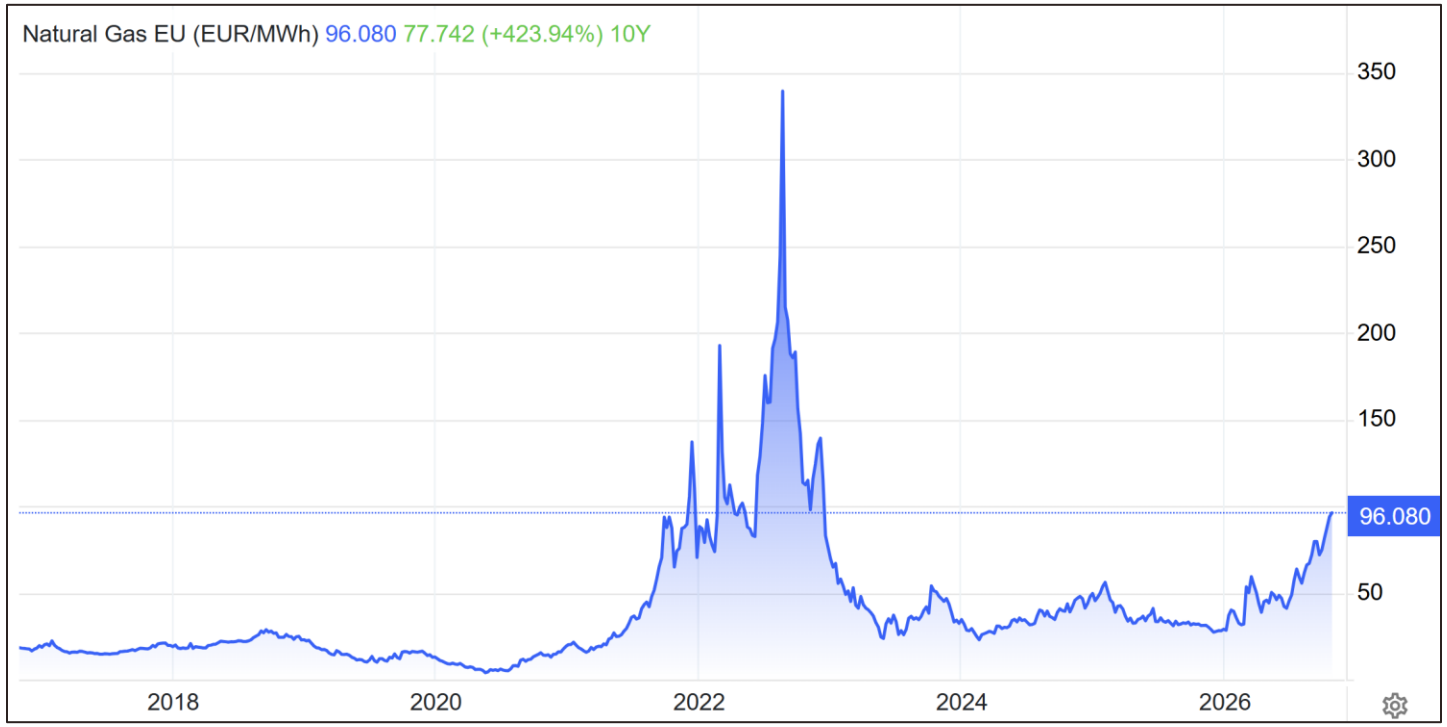


Global Scenario

Ideas to navigate the storm rationally and with a forward-looking view

Natural gas price instability

Natural gas EU [€/MWh]



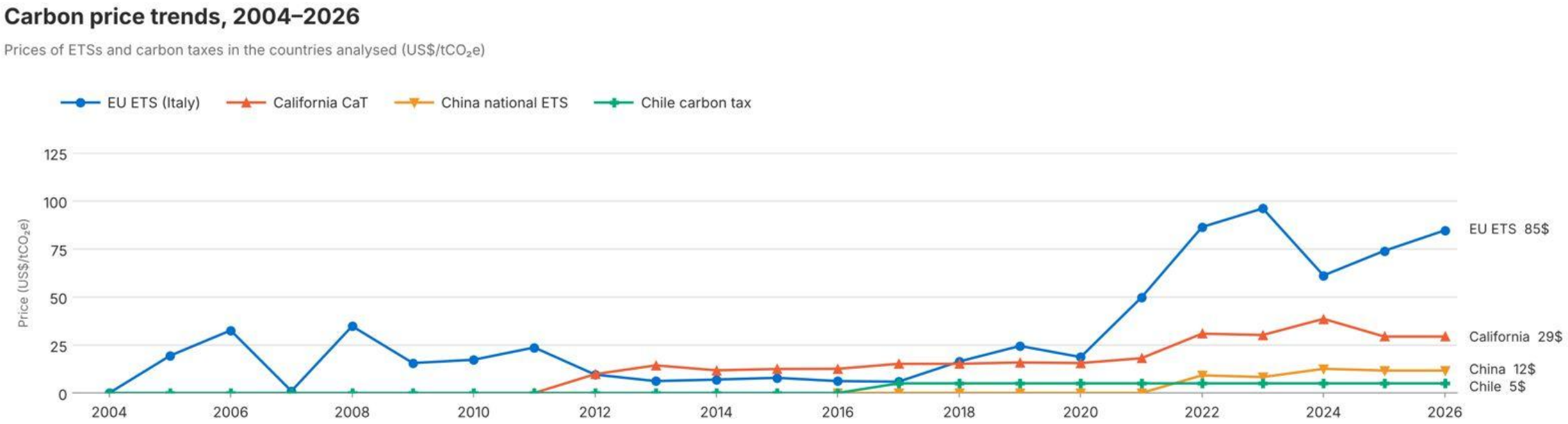
What the chart means to tomato processors

- Before the Covid-19 pandemic, gas cost was **€15–25/MWh**, and in 2020 it fell below 10.
- With the economic recovery and the war in Ukraine, the price rose to around **340 €/MWh** (August 2022). It then fell back to €30–50/MWh, which is still double the pre-Covid level.
- In 2026, tensions in the Strait of Hormuz pushed the price back up to around **€96/MWh**.

Energy prices are no longer predictable: **every kWh saved makes a plant more competitive.**
Building resilience across the whole processing line **cannot be postponed.**

Source: https://tradingeconomics.com/commodity/eu-natural-gas (as of 27/10/2026)

Two decades of carbon ETS prices



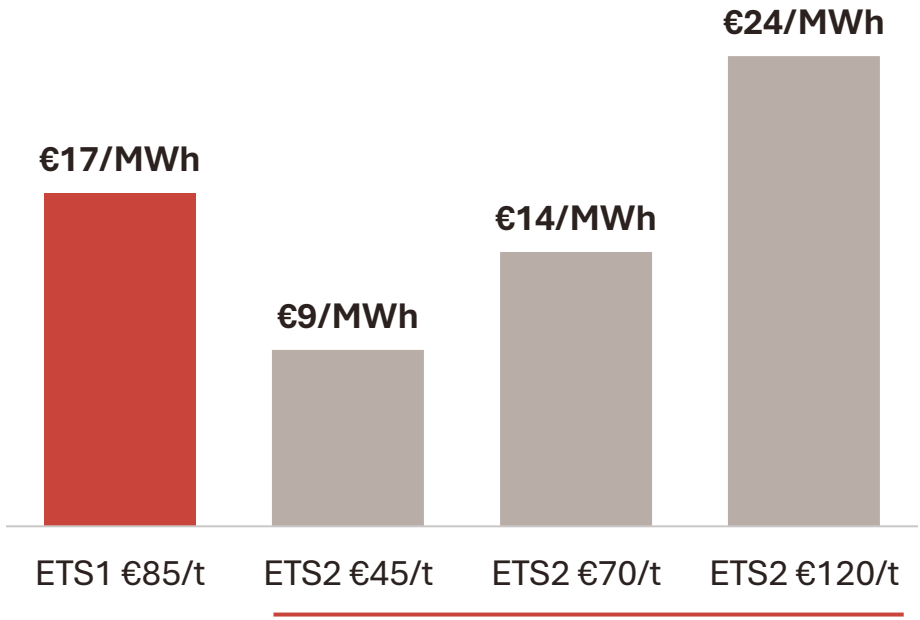
- The EU ETS is the most expensive carbon market: about \$85/tCO_2e in 2026, after a peak of \$96 in 2023. It has risen sharply since 2018.
- Elsewhere carbon is much cheaper: California ≈ \$29, China ≈ \$12, Chile a fixed \$5.
- An EU emitter pays about 3×California, 7×China and 17×Chile.

Source: https://carbonpricingdashboard.worldbank.org/compliance/price

ETS1 now. ETS2 from January ’28: what is changing

	ETS1	ETS2
Who is covered	Plants ≥ 20 MW thermal input	Plants < 20 MW, buildings, road transport
Who pays	The plant operator buys and surrenders EUAs	The fuel supplier, passed on in the gas bill
Start	Since 2005	1 January 2028
Carbon price	~€85/t (Oct 2026)	Set at auction; extra supply above €45/t
Free allocation	≤ 30% in 2026, none after 2030	None: 100% auctioned
Electricity	Paid via the power price (power producers pay ETS1)	

ETS1 adds about €17 per MWh of gas today for large plants
ETS2 will add €9–24 from 2028 for small plants



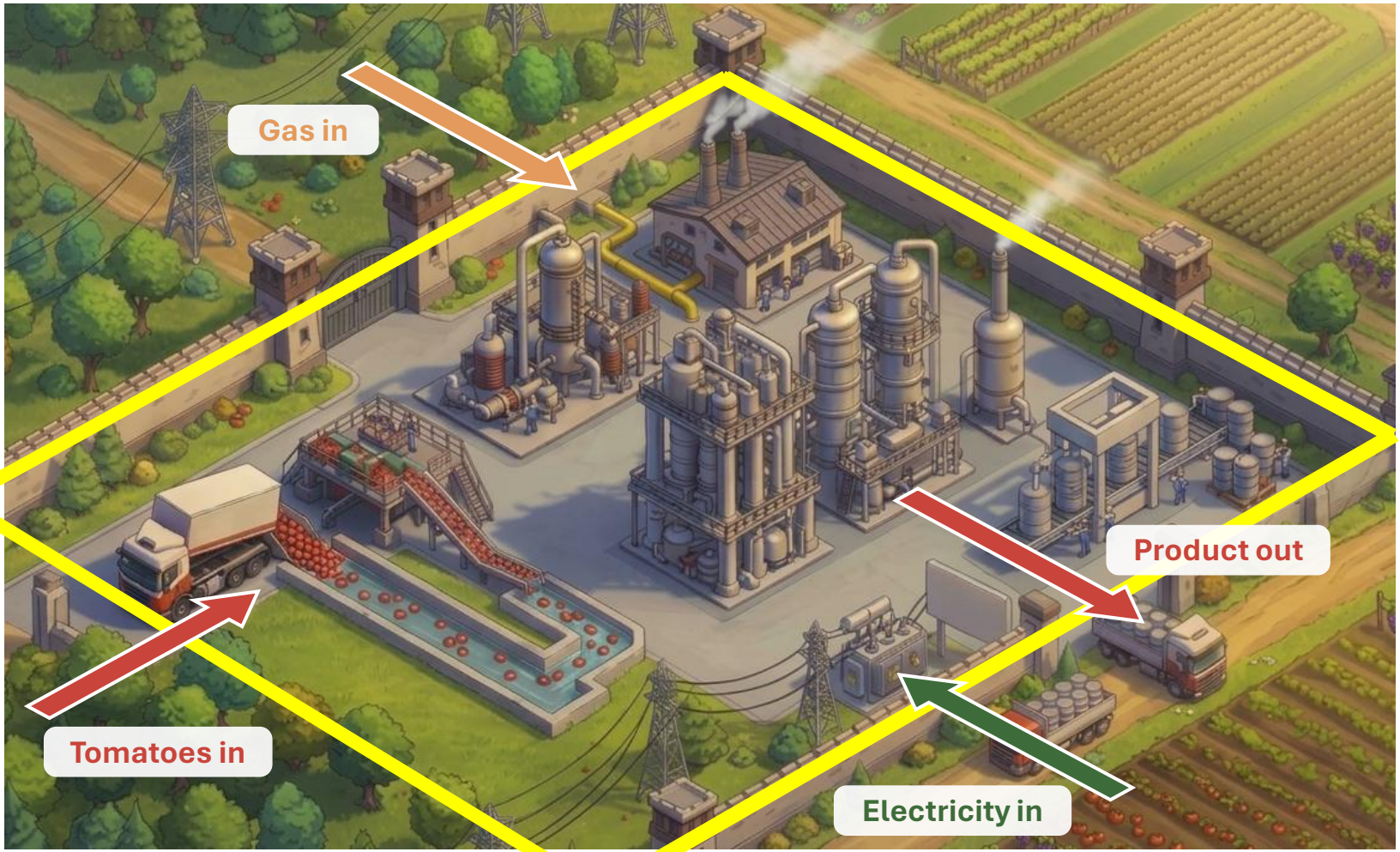
Carbon cost = 0.2 tCO_2/MWh gas (LHV) × allowance price. ETS2 values are scenarios: the €45/t trigger releases extra allowances but is not a cap.
Source: ICE EUA Dec-26 futures, Oct 2026; Directive (EU) 2023/959; Regulation (EU) 2026/667 (ETS2 start postponed to 2028).

Building resilience

Ideas to navigate the storm rationally and with a forward-looking view

The tomato paste factory

Diagram of a tomato processing plant



Proposed methodology

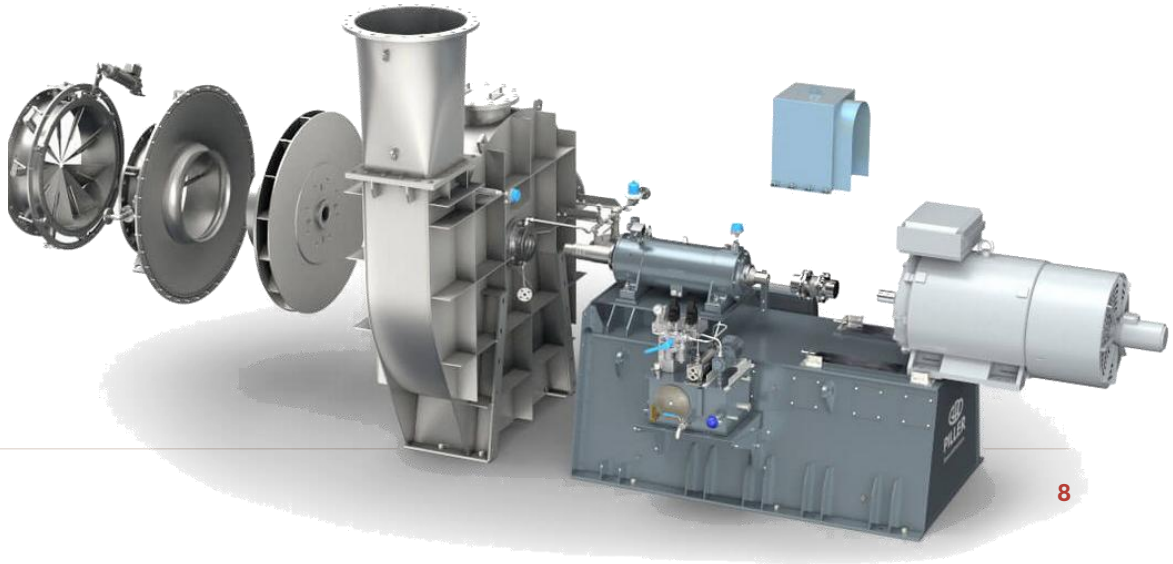
- The **perimeter** around the factory defines the **battleground** of the optimization process (not the one around a group of units).

The processor’s toolbox to improve efficiency

Improving evaporators’ steam economy with MVR (Mechanical Vapor Recompression)

- **Pros** and **Cons**:
  - ↑ Cuts steam consumption to negligible levels (1-3% of the water removal).
  - ↑ Significantly reduces the power of the cooling towers (9-10% compared to triple effect).
  - ↓ LD falling film version requires frequent CIP (once every 1-3 weeks depending on product).
  - ↓ Requires large installed compressor power (16-17 kW per t water removal at 6,5°C ΔT).
  - ↓ Less heat-sink capacity to condense turbine exhaust steam.

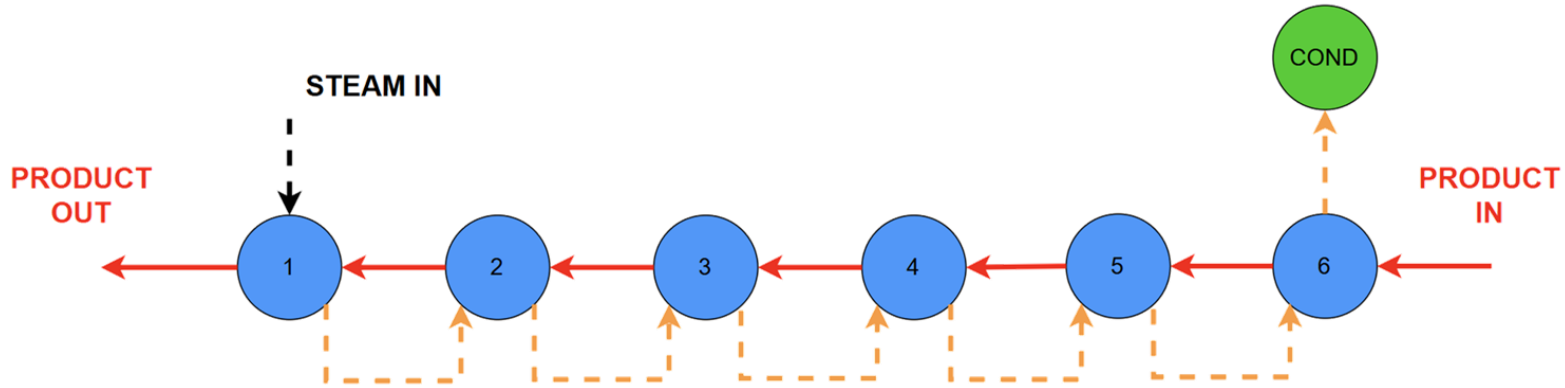
- **Where to use it:**
  LD (low density): up to 8,5 °Brix or 50% water removal (FF style)
  MD (mid density): up to 15 °Brix or 80% water removal (FC style), for passata (7–9) and pizza sauce (12–16 °Brix)
  HD (high density): up to 28–30 °Brix or 100% water removal (requires two-stage compression)



The processor’s toolbox to improve efficiency

Multiple effects evaporators

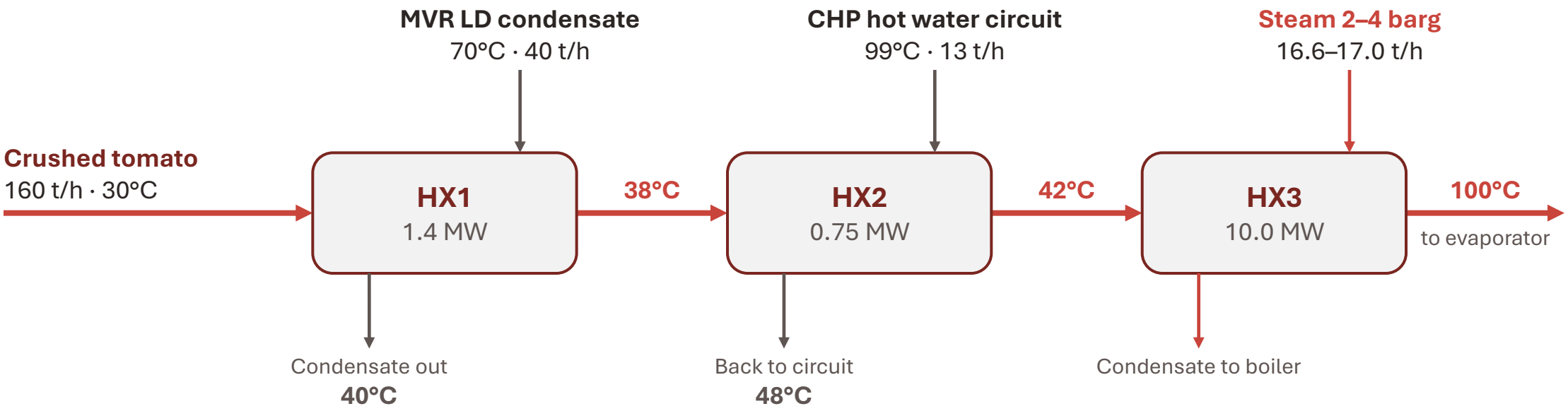
- **Pros** and **cons**:
  - ↑ Avoids the installation of large mechanical powers for compressor
  - ↑ Avoids electrical line update and transformers
  - ↑ Allows partial CIP (one column at a time) without ever fully stopping the production
  - ↑ Excels in regions with high electricity prices
  - ↓ Steam economy 1:6 vs 1:80 for LD MVR
  - ↓ Larger condenser and cooling towers compared to LD MVR



The processor's toolbox to improve efficiency

Recovery of waste heat

- Hot condensate return to boiler
- Preheating of crushed tomatoes:
  with LD and MD evaporators condensate at 70-75°C
  with hot water circuit at 99°C from CHP (combined heat and power)



Recovered heat covers **2.1 of 12.1 MW**: live steam drops by about 18% against heating 30→100°C with steam only.

HX2 limited to 750 kW (one 1.5 MWe CHP). cp tomato 3.9 kJ/kg·K, condensate and water 4.19 kJ/kg·K; counter-current exchangers; steam latent heat 2.163 kJ/kg at 2 barg, 2.108 kJ/kg at 4 barg.

The processor's toolbox to improve efficiency

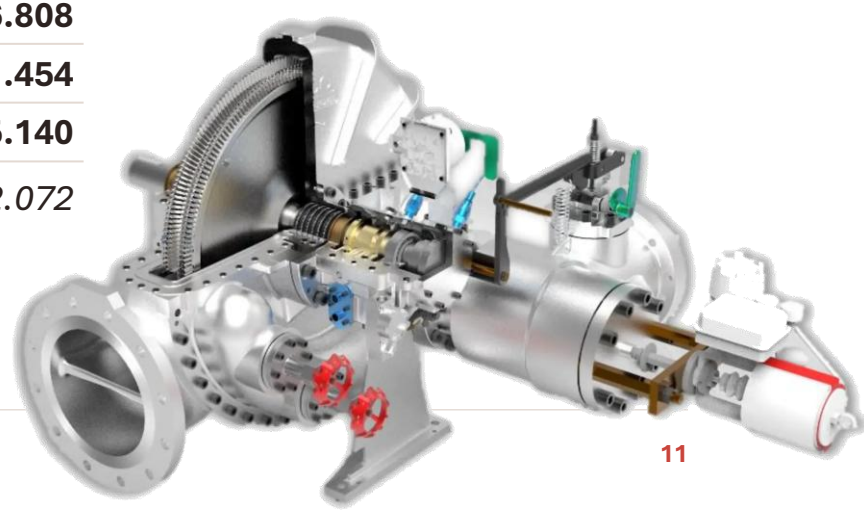
Double use of high-pressure steam: mechanical use through turbines, heat recovery in heat exchangers

- **High-pressure steam lines** at 20 barg (300 psig), 14 barg (200 psig) or similar.
- **Low-pressure headers** at 6 barg (90 psig) for the hot break and 2 barg (30 psig) or similar for evaporators
- The higher the pressure drop through the turbine, the lower the steam flow.

EXAMPLE: Annual saving – steam turbine replacing 700 kW electric motor (exhaust at 2 barg) – €/season

Country	Season hours (h)	Electricity (€/kWh)	Gas (€/kWh)	Inlet 30 barg	Inlet 20 barg	Inlet 14 barg
CALIFORNIA	2.160	0,2240	0,0326	**€ 329.901**	**€ 330.201**	**€ 333.040**
CHINA	2.160	0,0973	0,0470	**€ 134.449**	**€ 134.882**	**€ 138.975**
ITALY	2.520	0,1744	0,0536	**€ 290.787**	**€ 291.362**	**€ 296.808**
SPAIN	1.440	0,1160	0,0474	**€ 108.411**	**€ 108.701**	**€ 111.454**
CHILE	2.160	0,1536	0,0410	**€ 221.192**	**€ 221.569**	**€ 225.140**
Steam mass flow (kg/h)				*15.464*	*18.364*	*22.072*

Saving = avoided electricity – extra gas to raise steam from 10 barg to inlet pressure. Steam flow is the same for all countries.



The processor’s toolbox to improve efficiency

CHP (Combined Heat and Power) generation. The 1,5 MWe example.

- **Main features**:
  - **Electricity** generation: 1,5 MW (400V, 50 HZ) with an efficiency of 41,4%.
  - **Steam** generation: 637 kW (875 kg/h) with an efficiency of 17,6%
  - **High T water** (92-99°C) generation at : 750,7 kW with an efficiency of 20,7 %
  - **Low T water** (48°C) generation at : 156,0 kW with an efficiency of 4,3%
  - CHP **global efficiency** = 41,4+17,6+20,7+4,3 = 84%

Pros

- **84% efficiency** vs ~50% for grid + boiler
- **Own power:** no grid purchase or network fees
- **Steam and hot water** used in the process
- **White certificates** for high-efficiency CHP

Cons

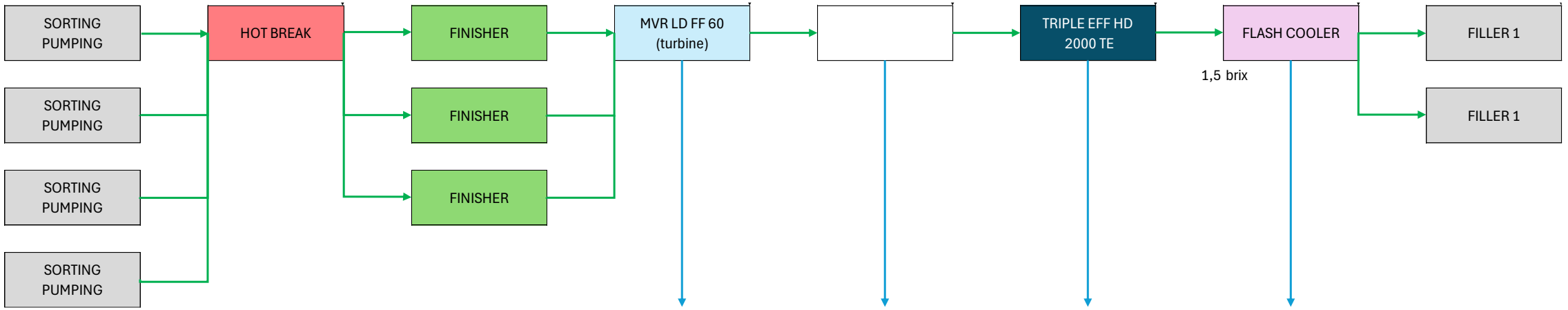
- **60–90 day campaign** stretches the payback
- **875 kg/h steam:** small share of evaporator demand
- **High capex** and engine maintenance
- **Price risk:** gas vs electricity prices

Case History

Evolution of a Hot Break tomato paste line toward efficiency

Case History 1: HB tomato paste line efficiency improvement scenarios

The line composition



Case History 1: HB tomato paste line efficiency improvement scenarios

Nine processing scenarios

	SOLUTION	CONFIGURATION	CHP %	LD MVR	MD MVR	HD TRIPLE	HD MVR
TRIPLE EFFECT	SOL1	TRIPLE HD (motor)				M	
	SOL2	TRIPLE HD (turbine)				T	
	SOL3	TRIPLE HD + CHP	99%			T T	
MVR - LD + TRIPLE EFFECT	SOL4	MVR LD + TRIPLE HD (motor)		M		M	
	SOL5	MVR LD + TRIPLE HD (turbine)		T		T	
	SOL6	MVR LD (turbine) + TRIPLE (turbine) + CHP	117%	T		T	
MVR - LD + MVR - HD	SOL7	MVR LD (turbine) +MVR HD (motor)		M			M
	SOL8	MVR LD (turbine) + MVR HD (motor)		T			M
	SOL9	MVR LD (motor) + MVR HD (motor) + GAS GENERATOR CHP 4	99%	M			M

Case History 1: HB tomato paste line efficiency improvement scenarios

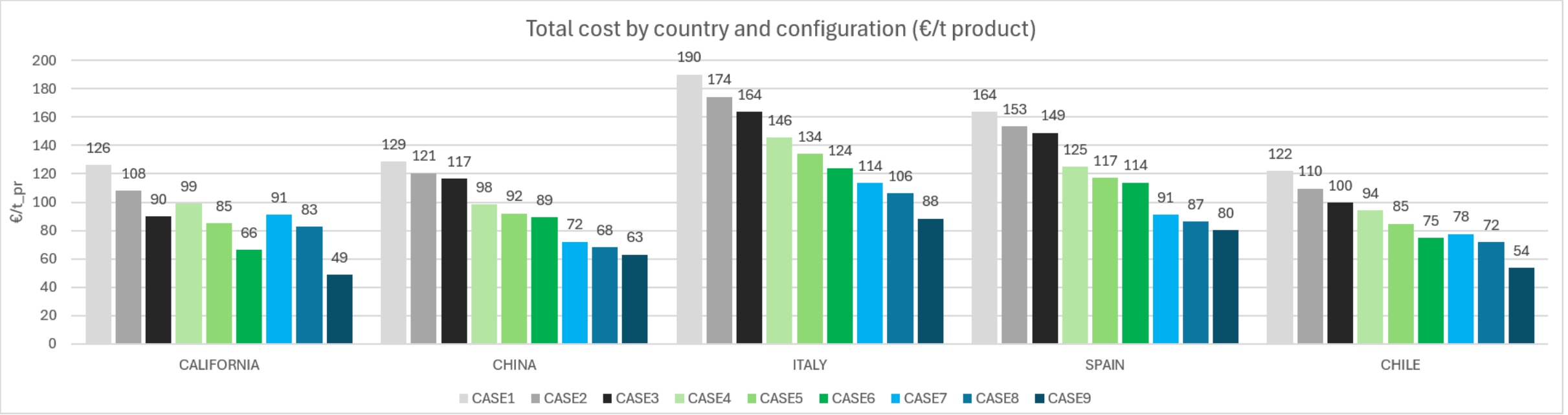
Five different regions with different Electric, Thermal and CO_2 price as well as grid characteristic

Country / Region	CALIFORNIA	CHINA	ITALY	SPAIN	CHILE
Source	*EIA*	*GlobalPetrolPrices*	*EU*	*EU*	*GlobalPetrolPrices*
Period	*lug-26*	*2023-2026*	*S1-2026*	*S1-2026*	*2023-2026*
Electricity cost (€/MWh)	224,0	97,3	174,4	116,0	153,6
Thermal cost gas (€/MWh)	32,6	47,0	53,6	47,4	41,0
Electric / thermal cost ratio	**6,9**	**2,1**	**3,3**	**2,4**	**3,7**
Thermal cost (€/t steam)	26,9	38,8	44,3	39,1	33,9
Season's length (months)	3,00	3,00	3,50	2,00	3,00
CO_2 cost (€/t)	25,89	10,71	75,89	75,89	4,46
ELECTRIC GRID CO_2 PRODUCTION ($kgCO_2$ / kWh)	0,189	0,525	0,285	0,154	0,289

Case History 1: HB tomato paste line efficiency improvement scenarios

Different results based on the region.

TRIPLE EFFECT
LD MVR + TRIPLE EFFECT
LD MVR + HD MVR



«Simple can be harder than complex:
You have to work hard to get your thinking
clean to make it simple.»

Steve Jobs

Thank you

Mario Gozzi · MGfoodtech