

**Advantages
of using recuperative
FLOX[®] combustion for the
thermal treatment of
landfill gas**

Chapters:

- Flameless oxidation FLOX[®]
- Autothermal methane concentration
- Recuperative combustion of landfill gas
- Waste heat recovery
- Aerobisation and climate protection effect

Flameless Oxidation FLOX[®]



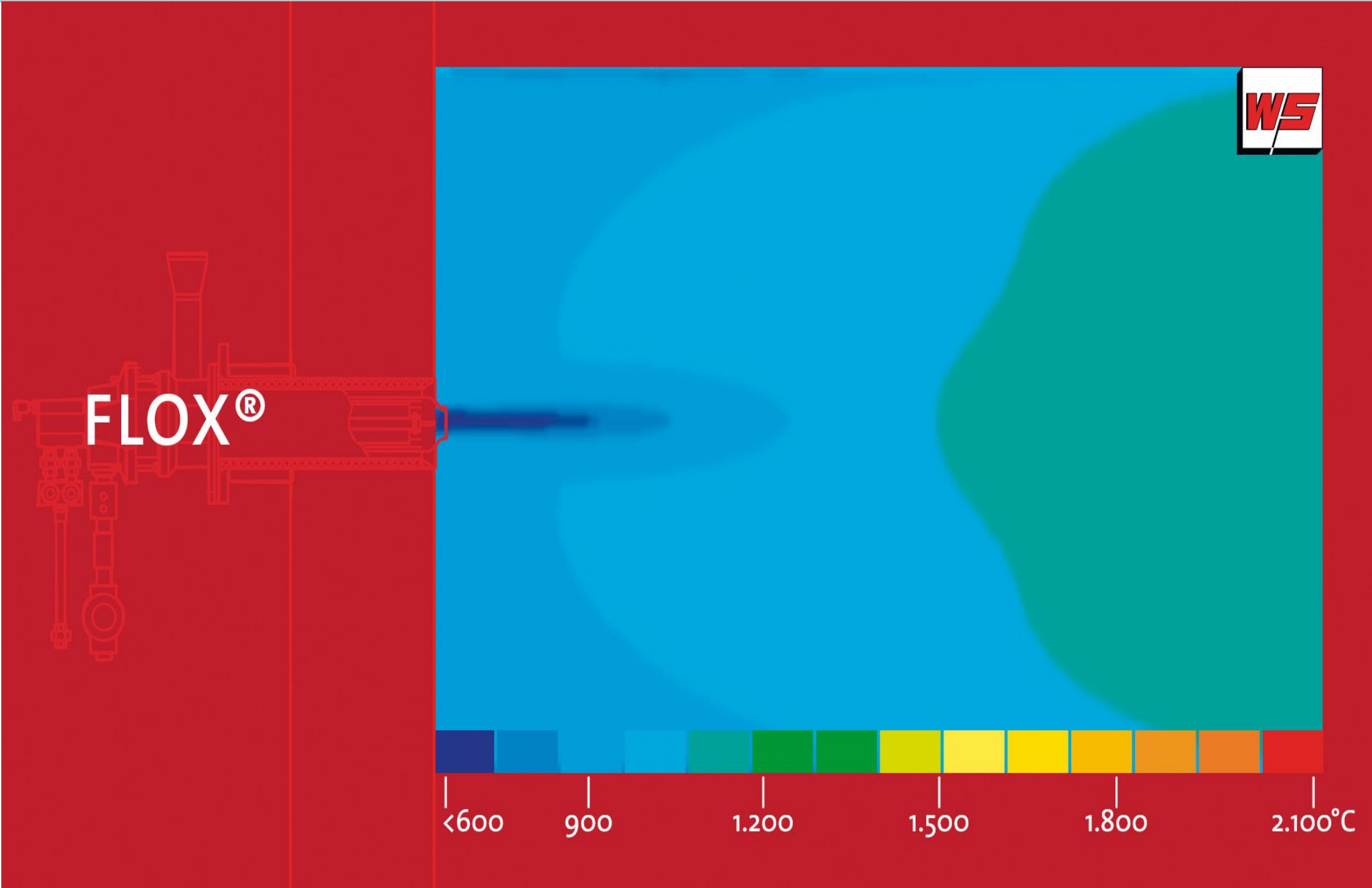
FLOX[®] describes a fire without a flame



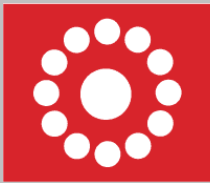
Flameless Oxidation



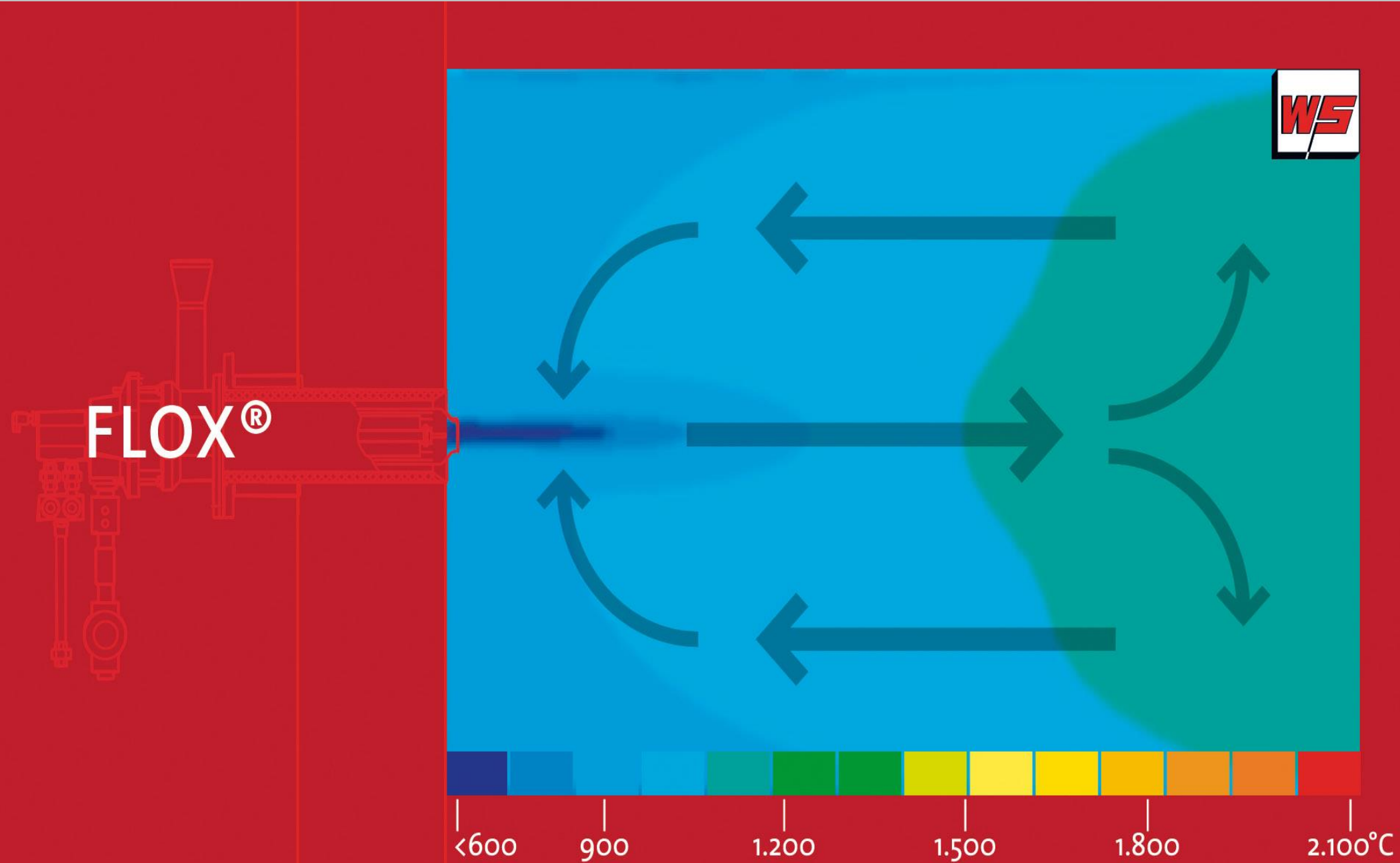
eflox



Flameless Oxidation FLOX[®]



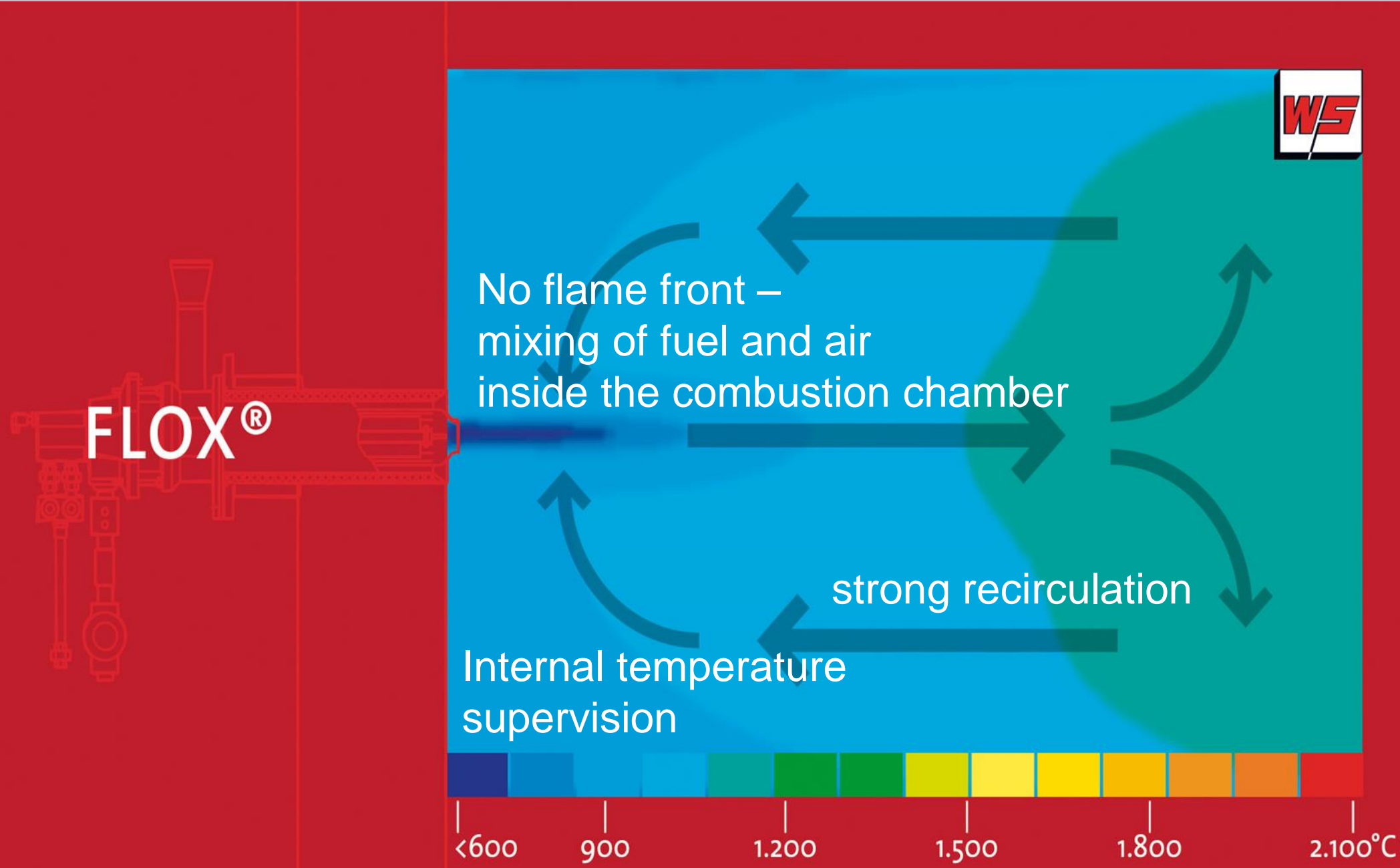
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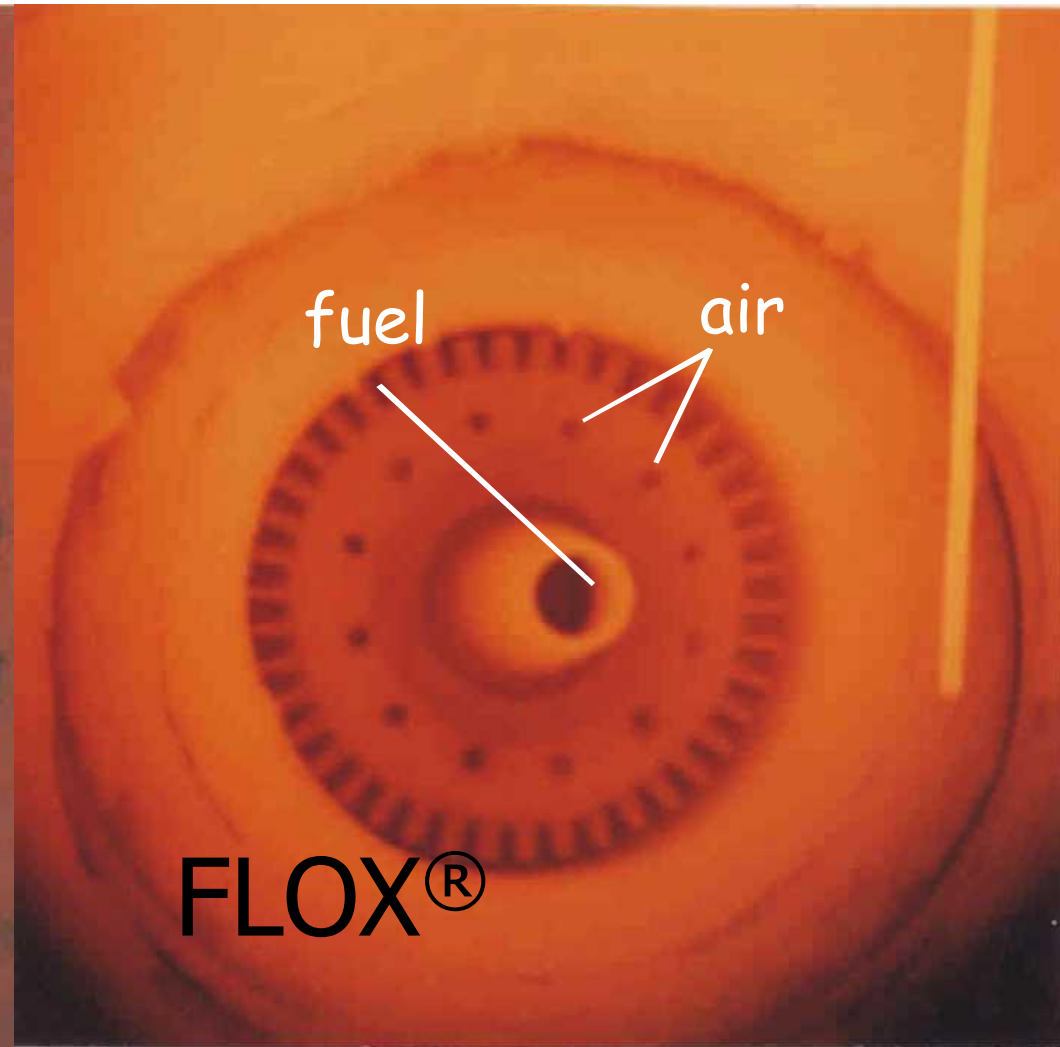
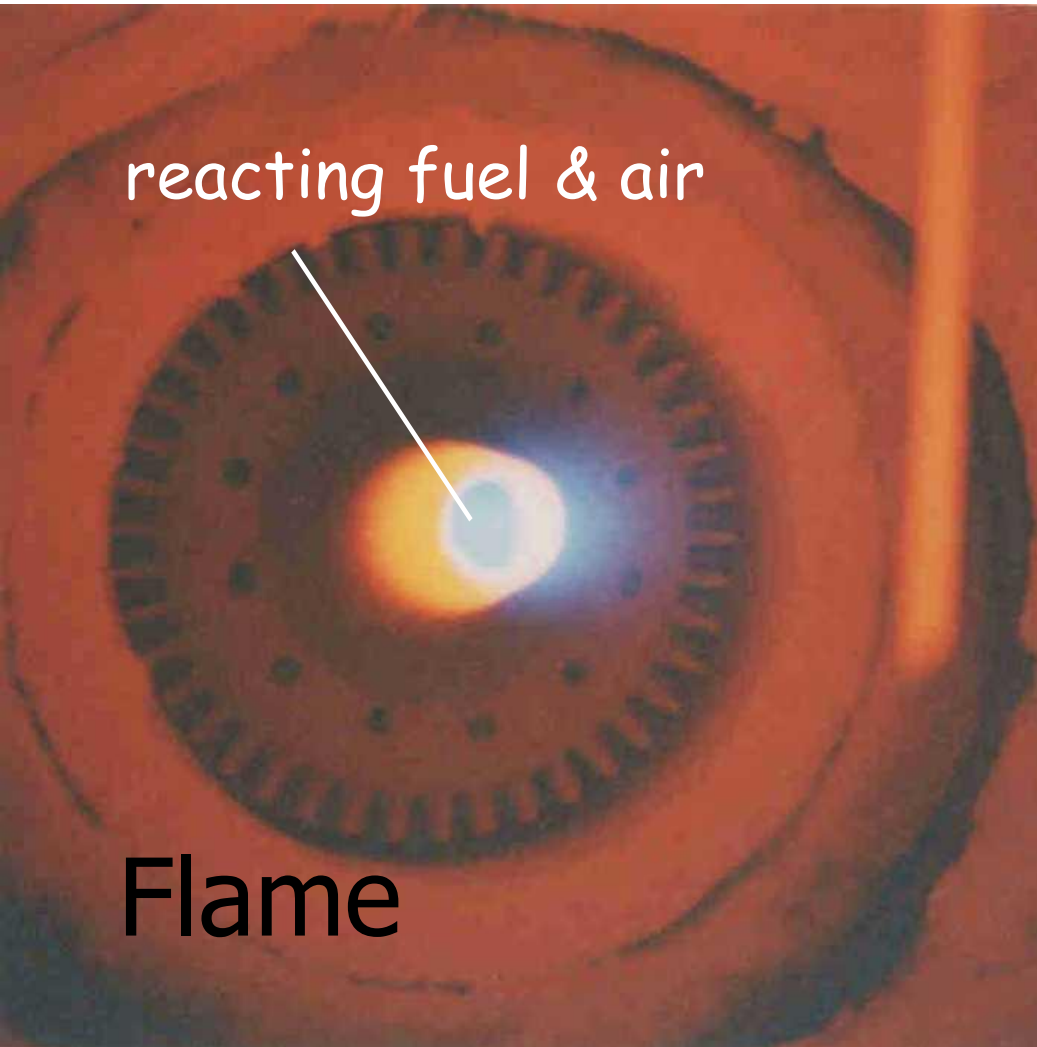


Flameless Oxidation FLOX[®]



eflox





Advantages of FLOX[®]

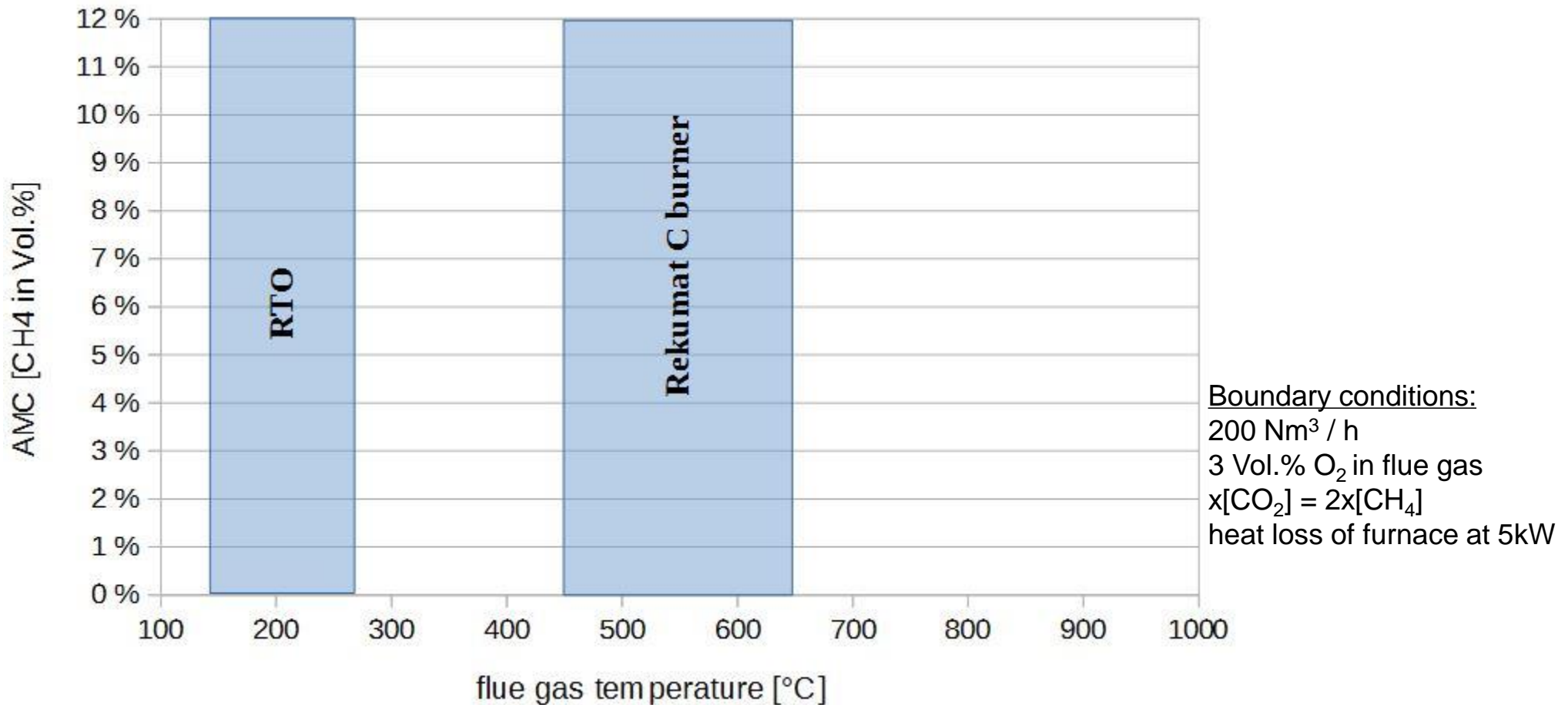
- Suppression of NO_x-formation
- Recuperation of flue gas energy
- no flame stabilization required
- Robust combustion of low calorific value gas or CO₂ rich gases

Autothermal methane concentration (AMC):

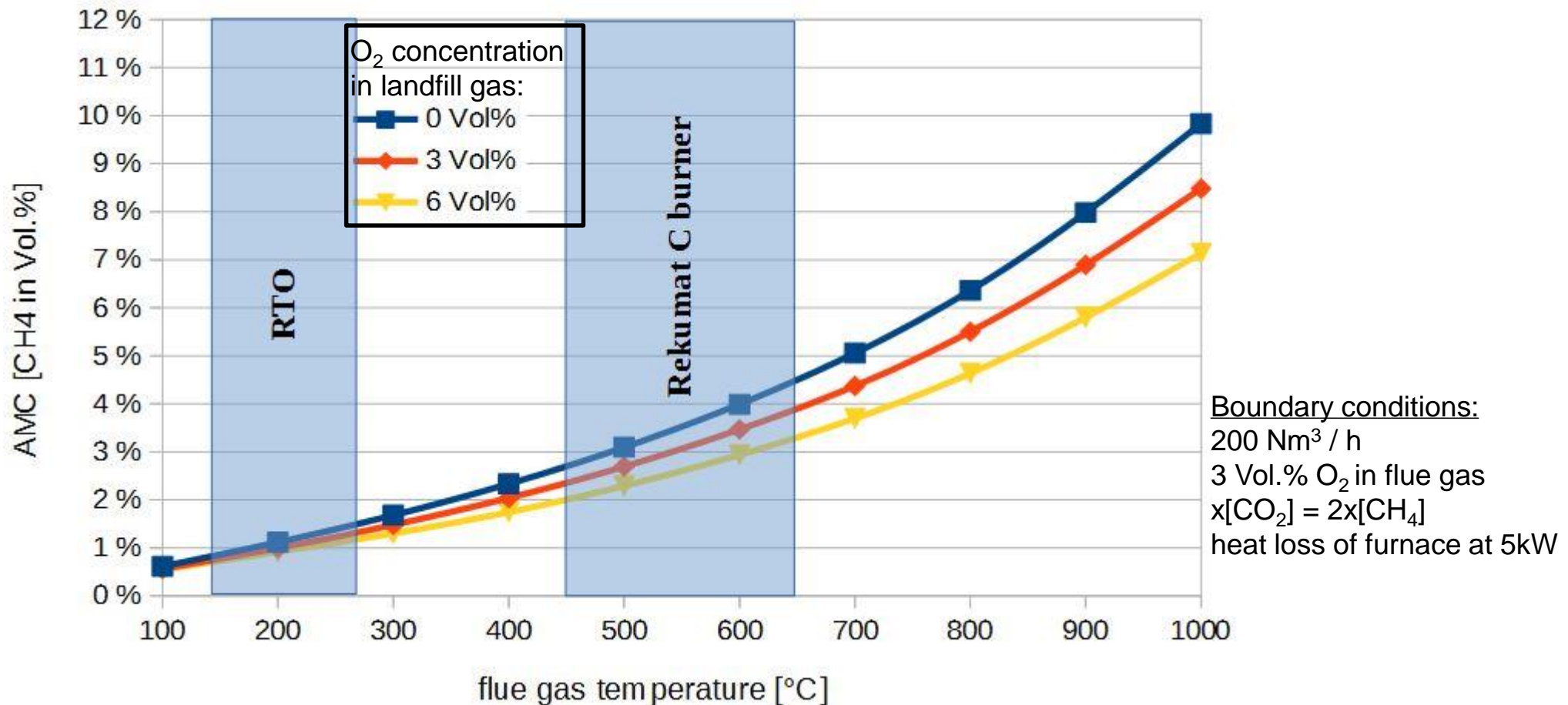
Minimal methane concentration which is required for combustion at sufficient temperature without supplement fuel. Typical limitations are instable flame and resulting flame detection problems.



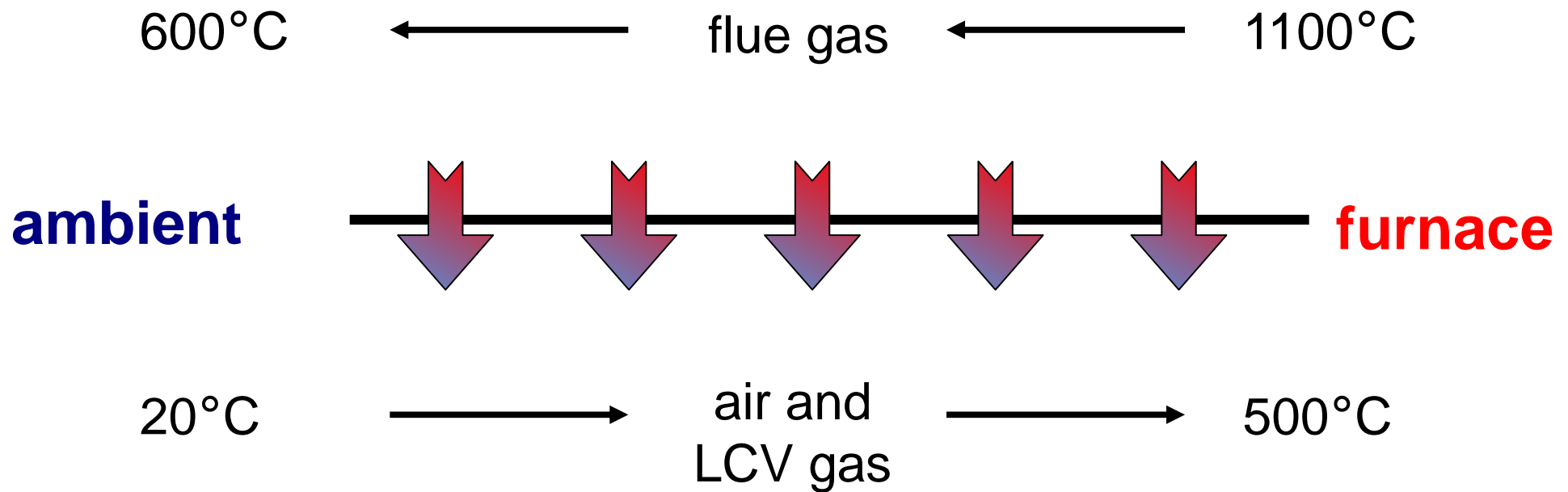
Autothermal methane concentration (AMC) in relation to flue gas temperature



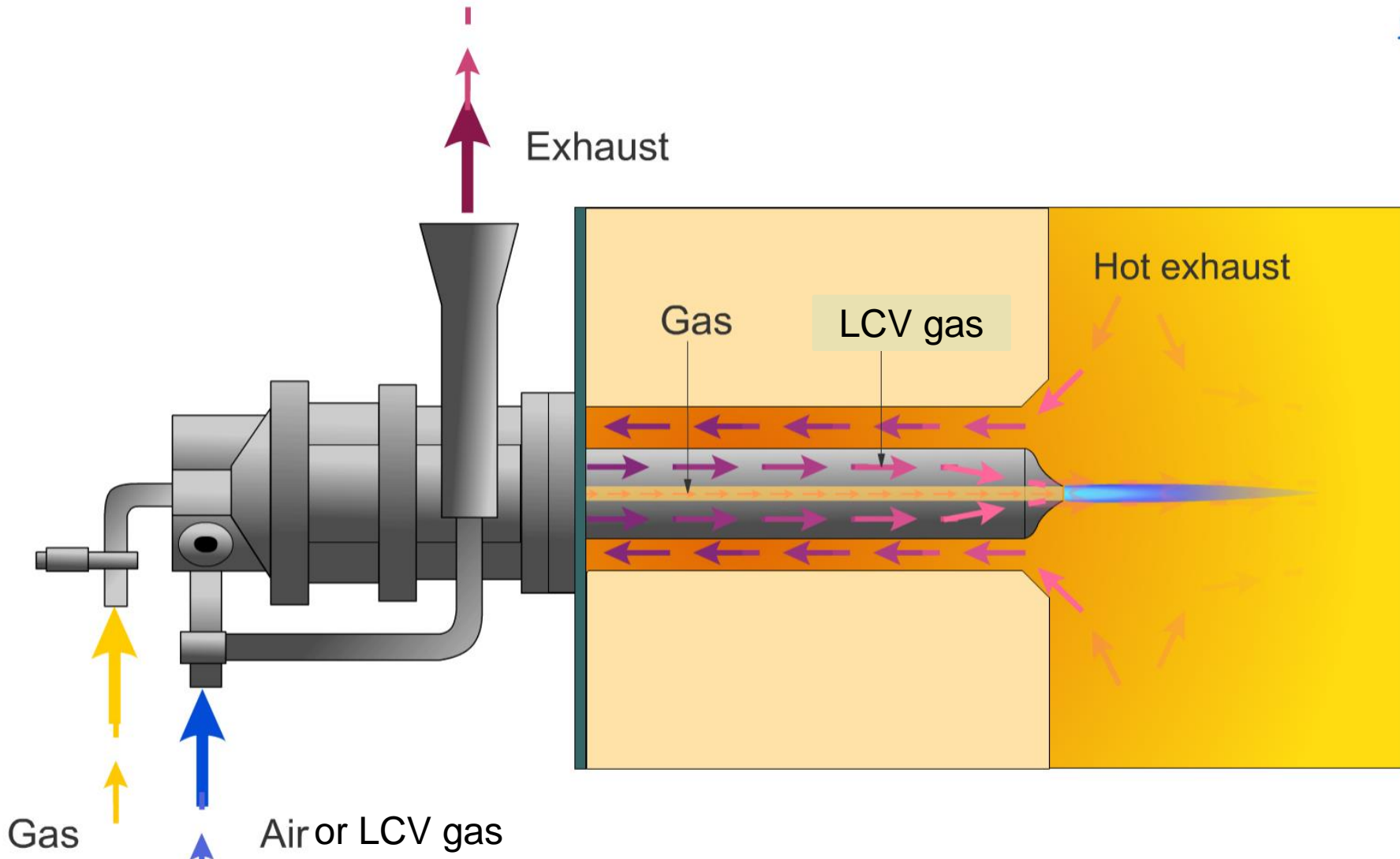
Autothermal methane concentration (AMC) in relation to flue gas temperature



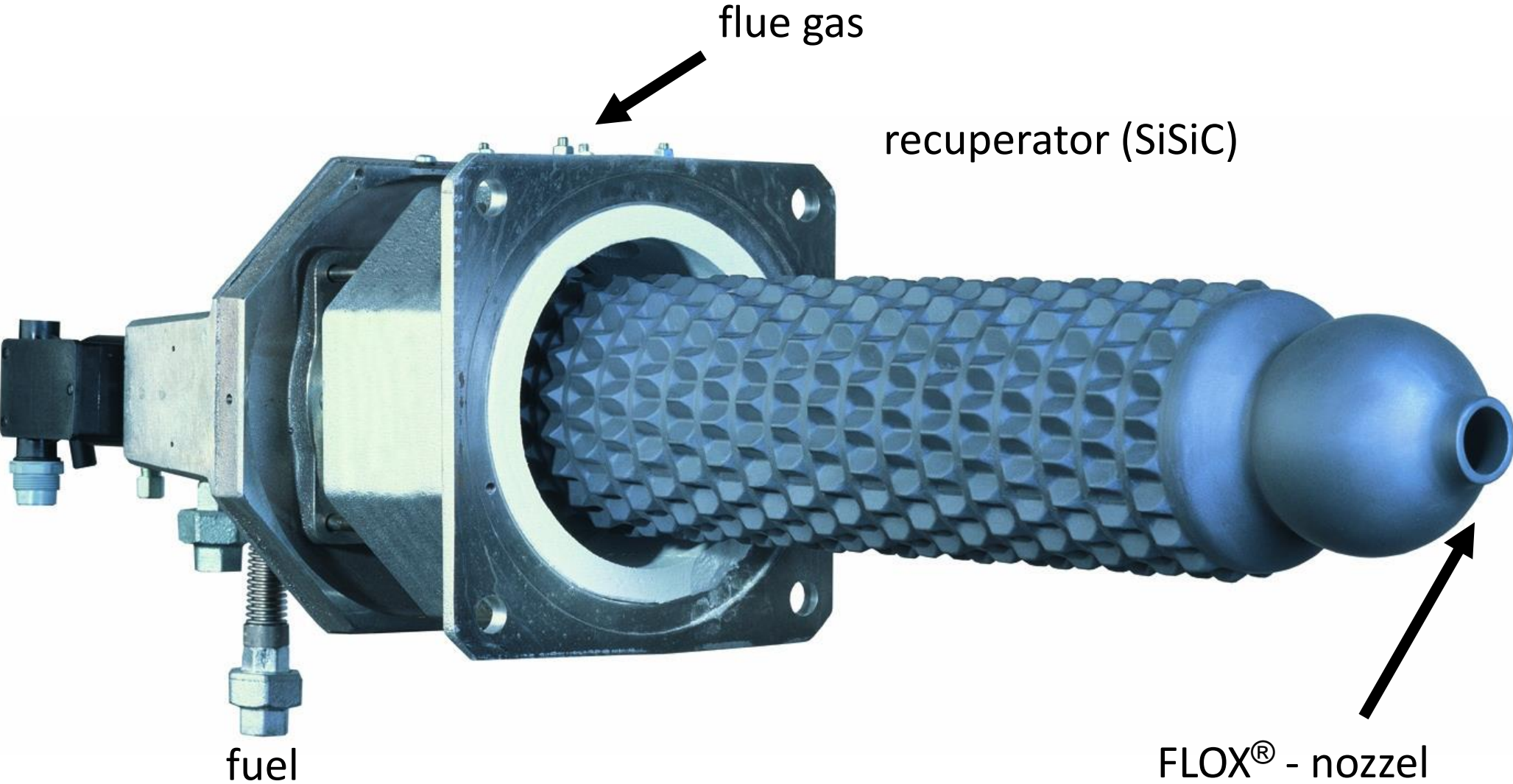
Heat recovery with recuperative (counter flow) heat exchanger



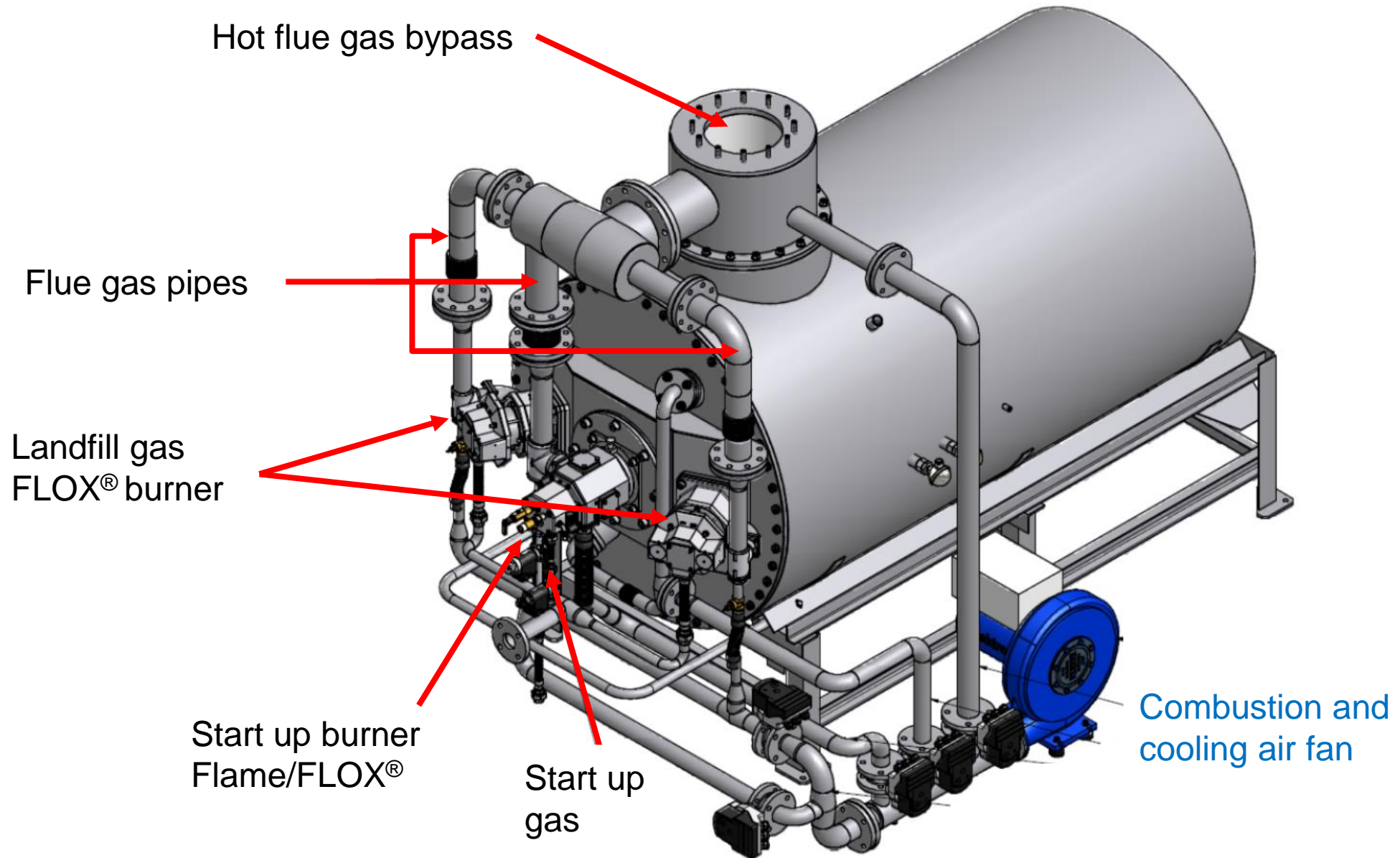
Recuperative combustion of LCV gas



Rekuperativer FLOX burner - C-Type



Landfill gas combustion plant

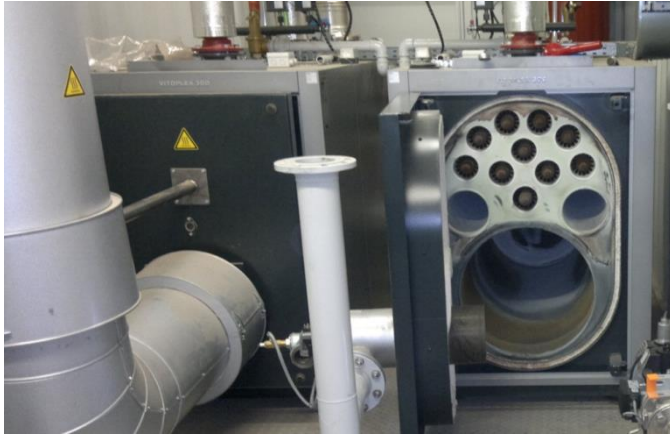


**Landfill gas energy
(methane)**

Conversion to electricity

**Preheat combustion air
Regenerative (RTO)
Recuperative (FLOX[®])**

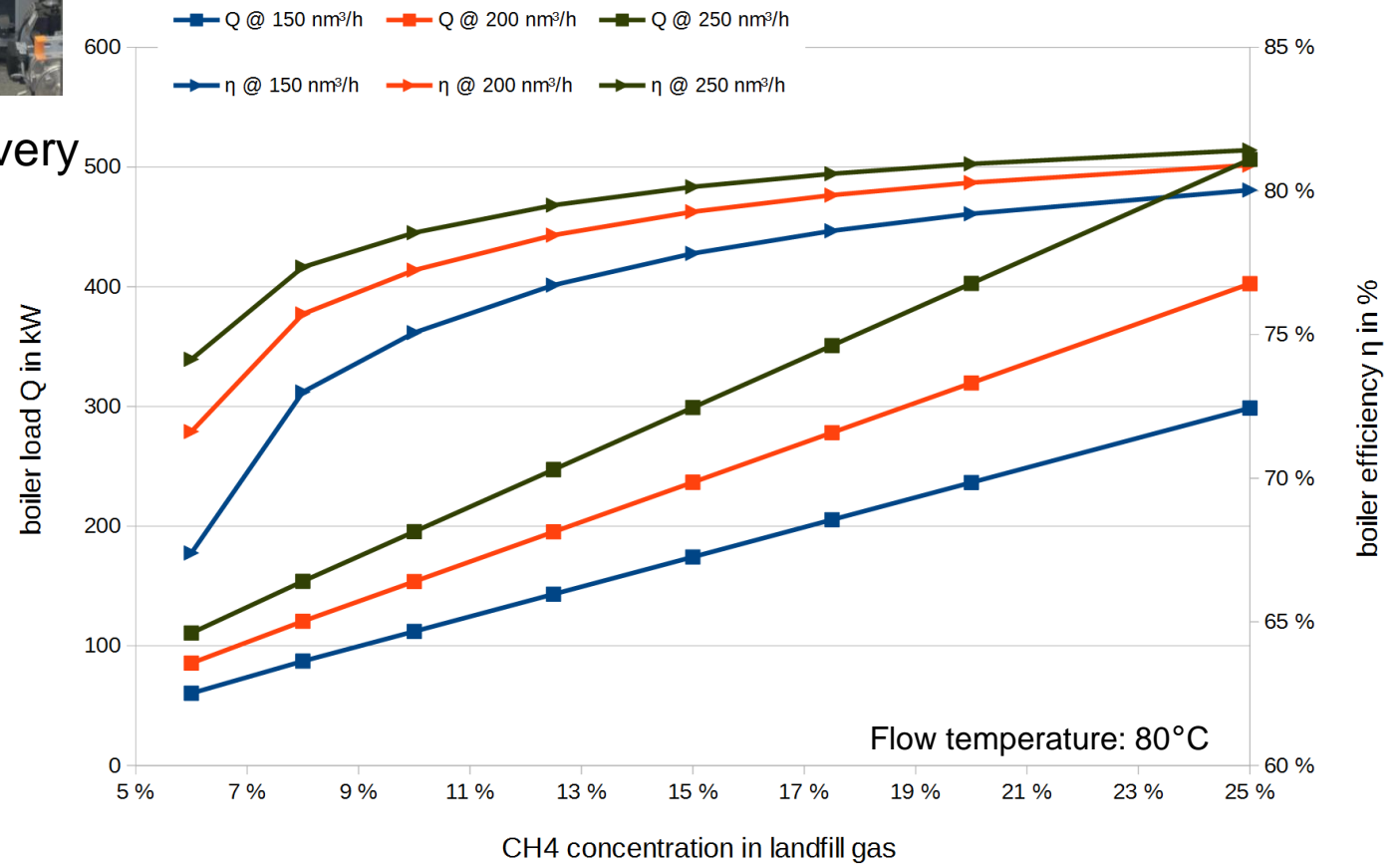
Remaining WASTE HEAT



Standart boiler for heat recovery

Hot Water

Efficiency for heat recovery



Electricity

Organic rankine cycle:

Efficiency(el.) approx. 13 – 18 %

Economic feasible > 500 kW_{th}



Courtesy of Dürr Cyplan Ltd.

Waste heat recovery



Dryer (wood chips)

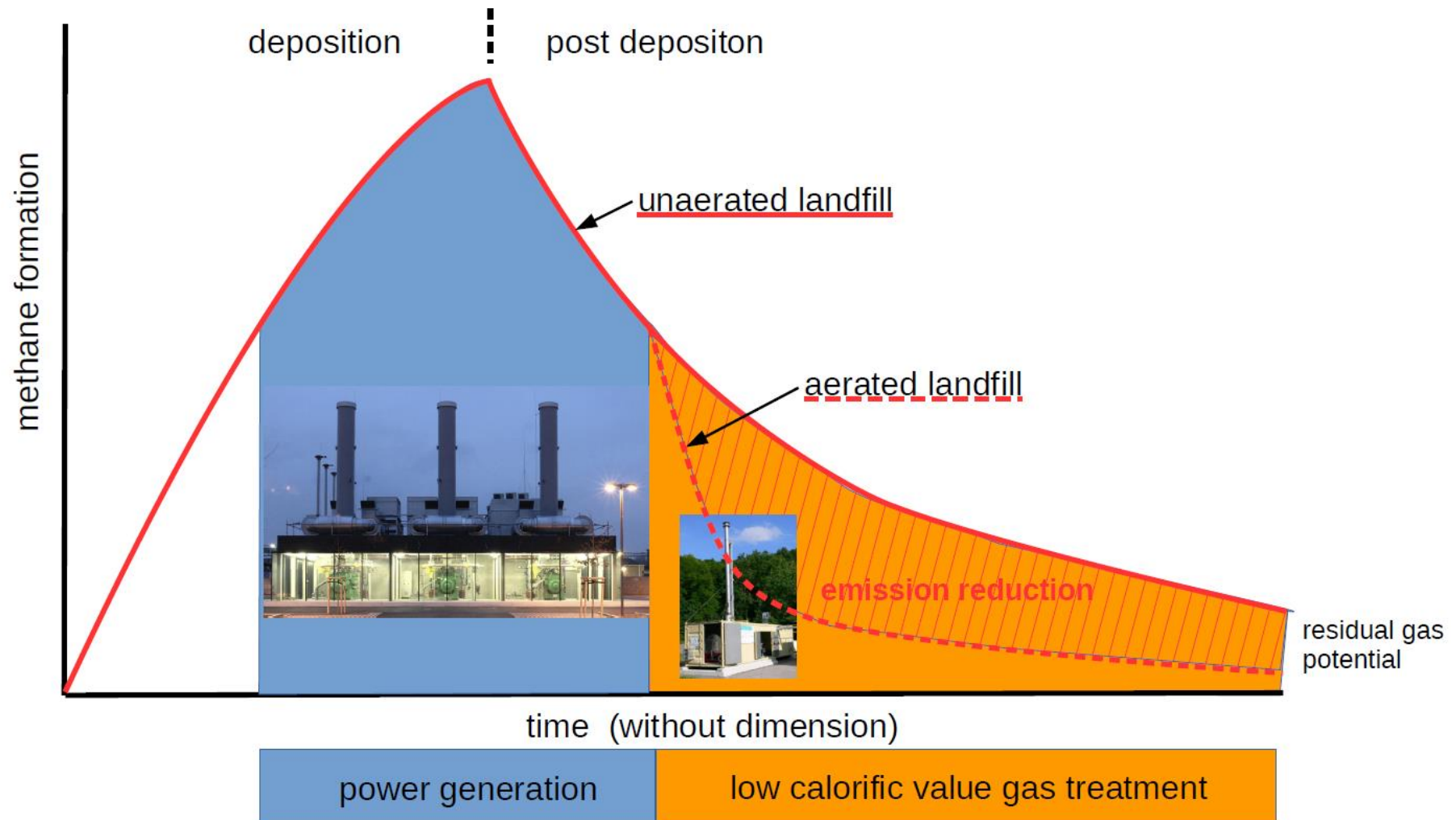


	Lifetime (yr)	GWP	
		Cumulative forcing over 20 years	Cumulative forcing over 100 years
CO ₂	b	1	1
CH ₄	12.4	84	28
N ₂ O	121.0	264	265
CF ₄	50,000.0	4880	6630
HFC-152a	1.5	506	138

Global Warming Potential (GWP)

An index measuring the *radiative forcing* following an emission of a unit mass of a given substance, accumulated over a chosen time horizon, relative to that of the reference substance, carbon dioxide (CO₂). The GWP thus represents the combined effect of the differing times these substances remain in the atmosphere and their effectiveness in causing *radiative forcing*.

Methane Emission from Municipal Landfills



Advantages of Aerobisation

- Reduces methane emissions from landfills
- Contribution to climate protection
- Accelerated degradation of organics
- Acceleration and shortening of settlement
- Sooner reuse of the landfill site

Advantages

- FLOX[®] is a robust combustion technology
- Very low NO_x and CO emissions
- no flame has to be supervised or stabilized
- Thus landfill gases with varying calorific values can be treated (3% to 60 Vol.% of methane)
- Preheating of air and landfill gas with high system efficiency
- One technology for the aftercare time span of landfill
- Contributing to climate protection goals