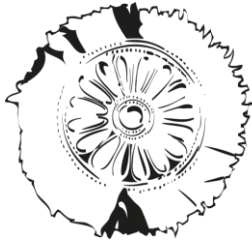
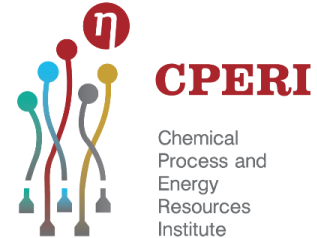


# Techno-economic analysis of acetic acid production from CO<sub>2</sub> derived from chemical looping combustion

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*2<sup>nd</sup> public workshop, 20 November 2024,*

# Business case description

CO<sub>2</sub> to Acetic Acid

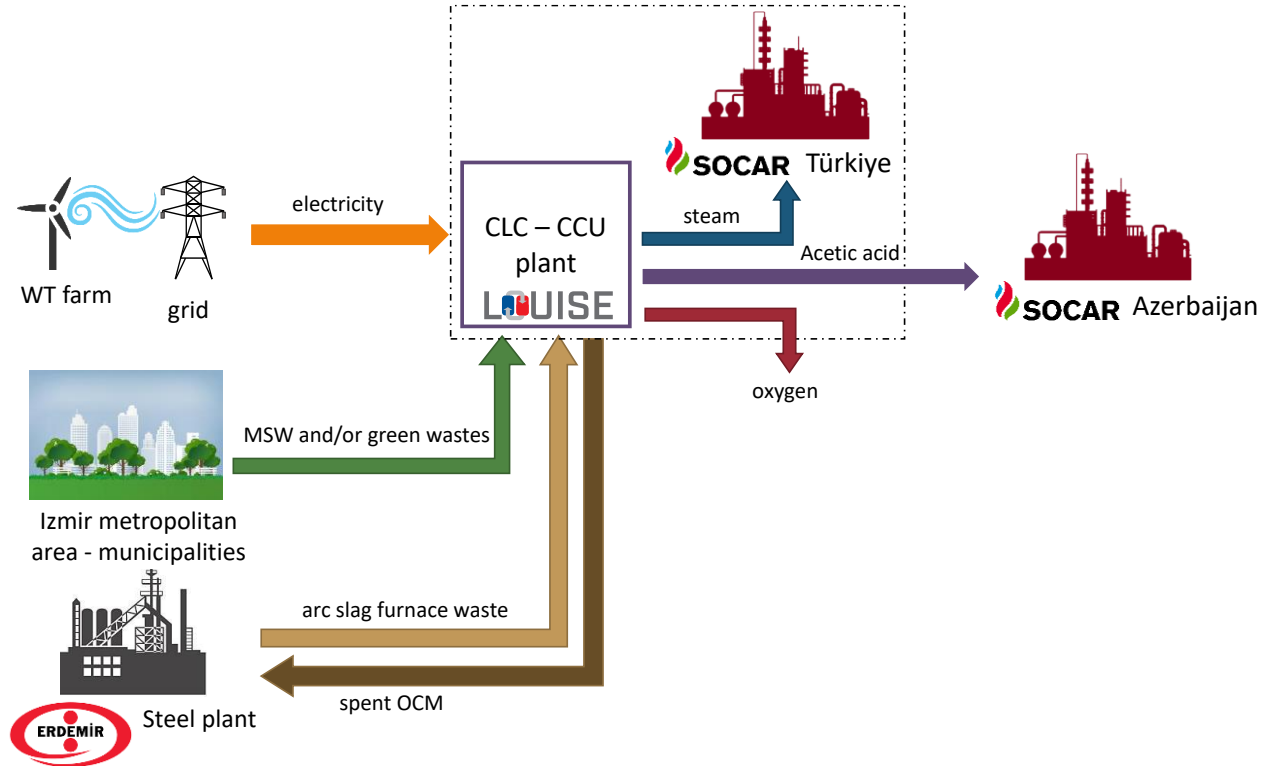
Location: SOCAR refinery, Türkiye

Feedstock supply: 150,000 t/y green waste from from Izmir metropolitan area → **100 MW<sub>th</sub>**

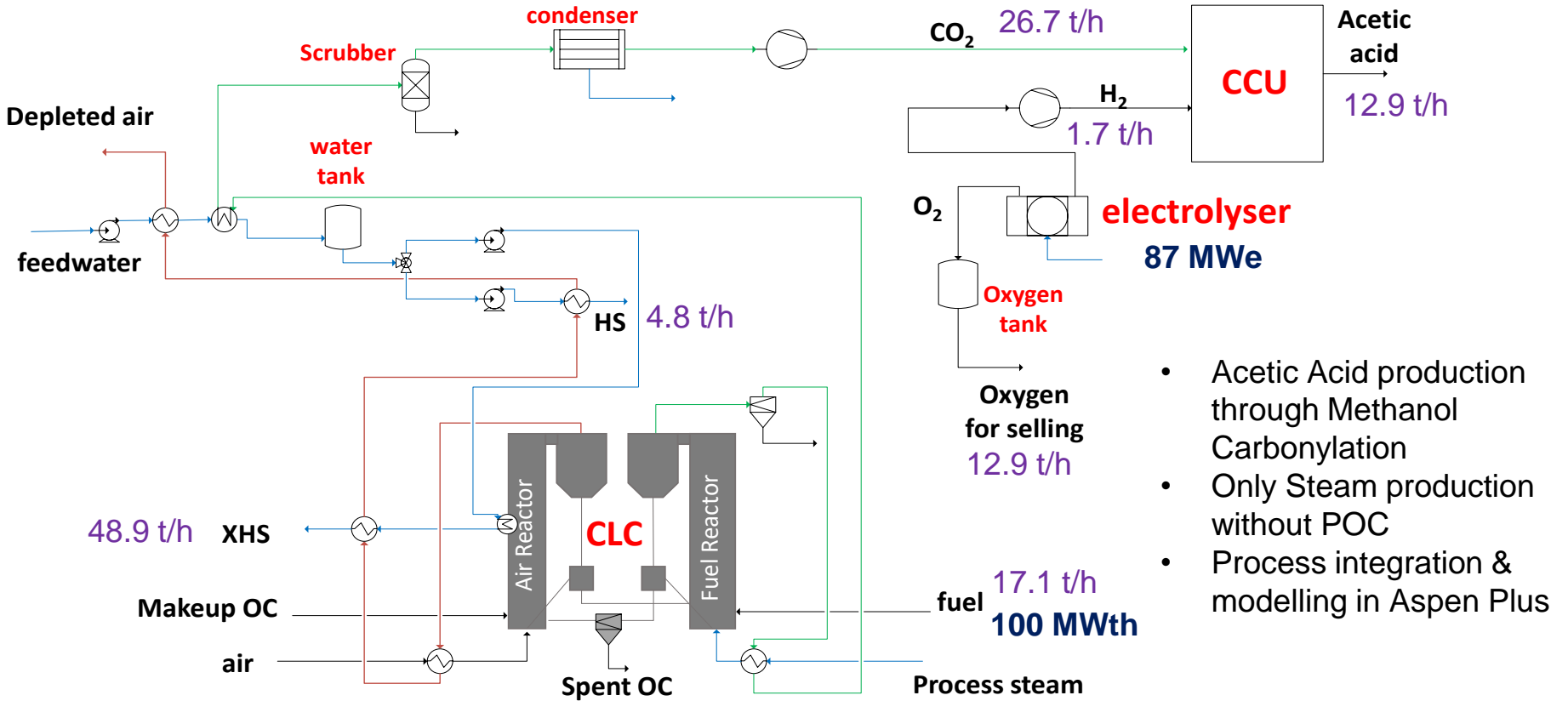
Power supply:

- **43.8MW** from WT park
- Rest from grid

Oxygen carrier material (OCM): supplied from ENDEMIR steel plant, Ereğli/Zonguldak



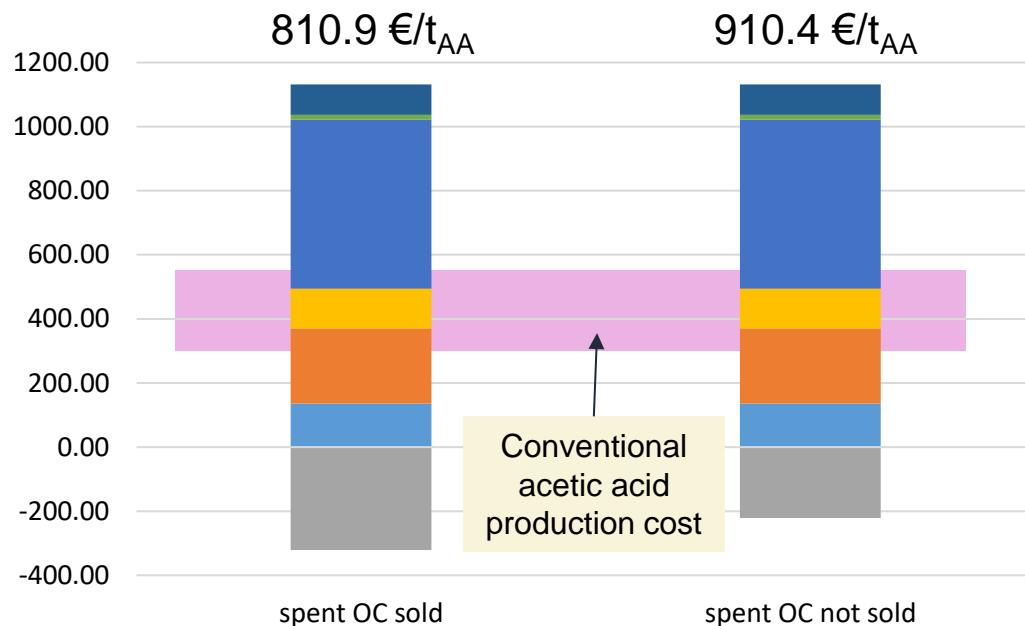
# Key mass and energy flows



- Acetic Acid production through Methanol Carbonylation
- Only Steam production without POC
- Process integration & modelling in Aspen Plus

# Techno-economic analysis

electricity price	0.05€/kWh
yearly operation	7500 hr
discount rate	8%
Plant lifetime	25 years
steam	steam steam
total maintenance cost	2.50% TPC
fuel transportation cost	15€/t
spent OC selling price	175€/t
cooling water	0.035€/t
oxygen selling price	75€/t
XSH steam selling price	53.94€/t
SH steam selling price	50.22€/t
annual salary	42000€/y



<b>CO<sub>2</sub> cost</b>	<b>24.05</b>	<b>€/t<sub>CO2</sub></b>
<b>H<sub>2</sub> cost</b>	<b>5.26</b>	<b>€/kg<sub>H2</sub></b>

- CLC CAPEX
- CLC OPEX
- CLC revenues
- Electrolyser CAPEX
- Electrolyser OPEX
- AA synthesis CAPEX
- AA synthesis OPEX

# Remarks

When Post Oxidation Chamber is not included in the flue gas processing & cleaning:

- 25.4% less H<sub>2</sub> demand for Carbon Utilization owed to the existing H<sub>2</sub> and CO in rich-CO<sub>2</sub> stream
- 33% more available O<sub>2</sub> for selling
- 42% less steam generation
- 12.6% less acetic acid production due to CH<sub>4</sub> in the rich CO<sub>2</sub> stream and a purged stream from methanol synthesis to avoid accumulation

CO<sub>2</sub> capture cost

- Lower CAPEX because of absence of POC, ASU and power generation island
- Oxygen-carrier's cost: Major factor in OPEX
- CLC with green wastes targeting to heat production is a competitive and economically appealing option for CO<sub>2</sub> capture

Acetic Acid cost

- Electrolyser capital and operational cost is the most important factor that affects the overall production cost
- Two times greater than conventional one but there are prospects to become more competitive