

Working together to energize the world

*Renewable gas,
Hydrogen and CCU*

The Future is Green



Contacts - Renewables



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Our Journey into New Energies

1984

Frames founded as system supplier & technology house for the energy industry



2000-2005

Opening international offices, working together closely with customers and global suppliers



2012

Delivery of Waste to Biogas plant at HVC, utilizing a predecessor of LAMINOL®



2018

Delivery of plug and play, containerized Hydrogen Electrolyzer systems



2020

Hydrogen Fueling Station and Mobility solutions



1980

2005

2010

2015

2020

2009

Frames enters Renewable Energies market



2015

Biogas upgrading unit order based on LAMINOL® technology



2019

CO₂ capture unit for greenhouse application based on GALLOXOL® technology operational



2020

Desulfurization unit for refining based on LAMINOL® operational



Frames Renewable Energy Solutions

- CO₂ Capture and reuse technologie



Frames Renewables

Renewable gas, hydrogen & CCU

The
Renewable
Gas
specialist

Solutions
for a
carbon
neutral
future

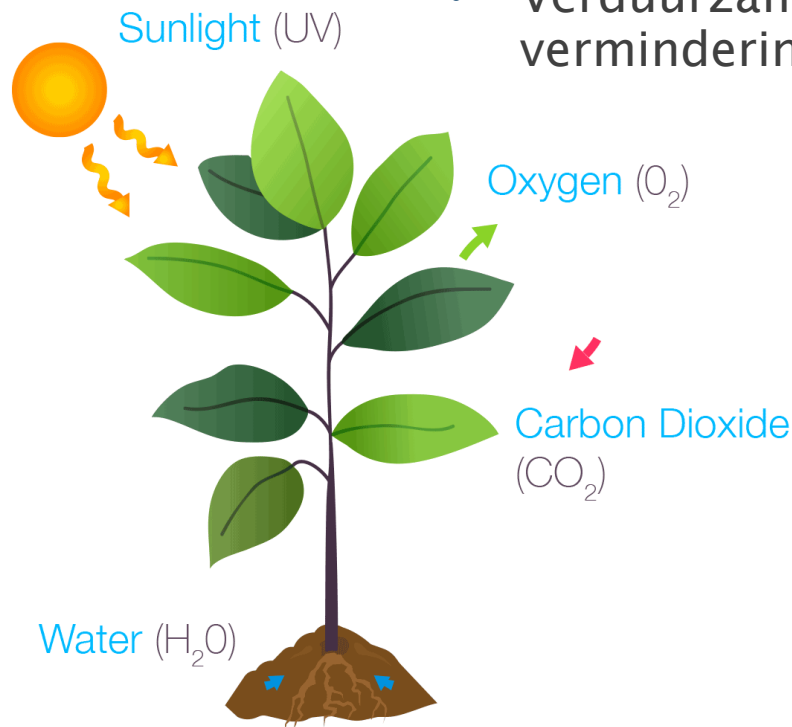
Part of

 **FRAMES**

Group

CO₂ uit de rookgassen van biomassa verbranding?

- Fotosynthese -> CO₂!
- CO₂ bemesting zorgt voor extra groei.
- Warmte voor de tuinbouwkassen
- Verduurzaming glastuinbouwsector door vermindering aardgasgebruik



De huidige situatie?

- Warmte en CO₂ uit aardgas in voorjaar en najaar.:
 - Gas WKK
 - Gas ketel
- Vloeibare CO₂ aanvulling in de zomer
- Of wanneer aanwezig OCAP CO₂



De nieuwe situatie!

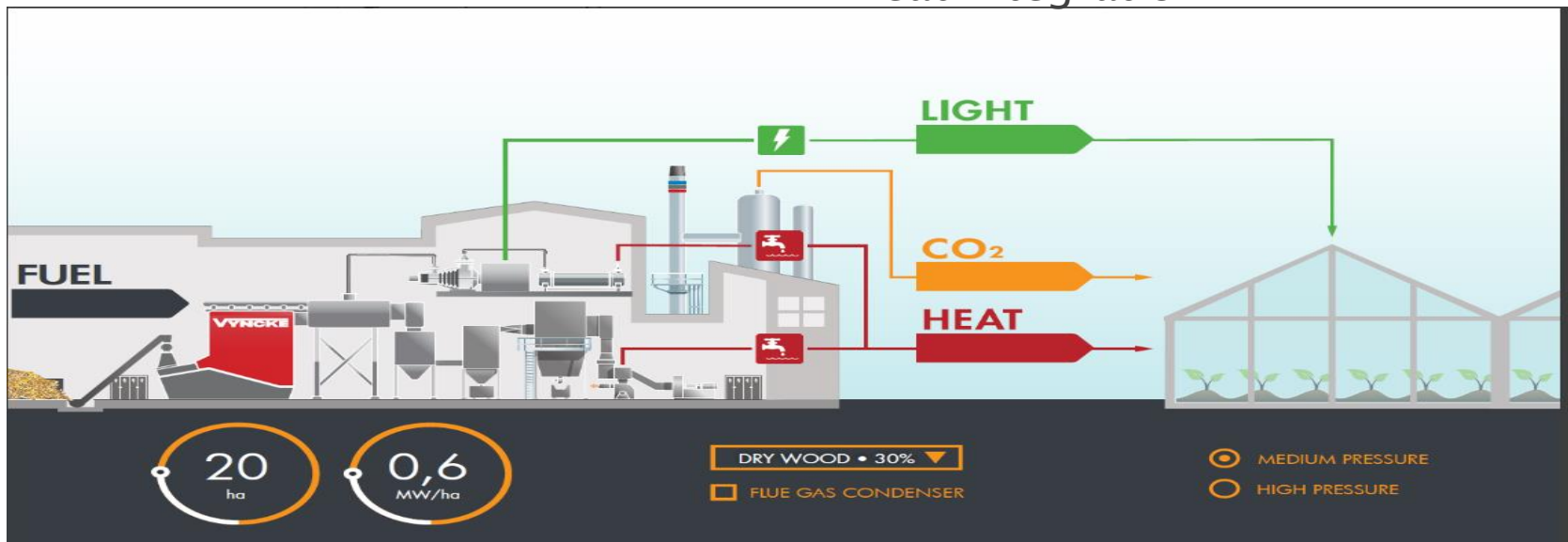


Biomassa Boiler (7-20 MWht)

- Wood Chips
- 140°C pressure boiler

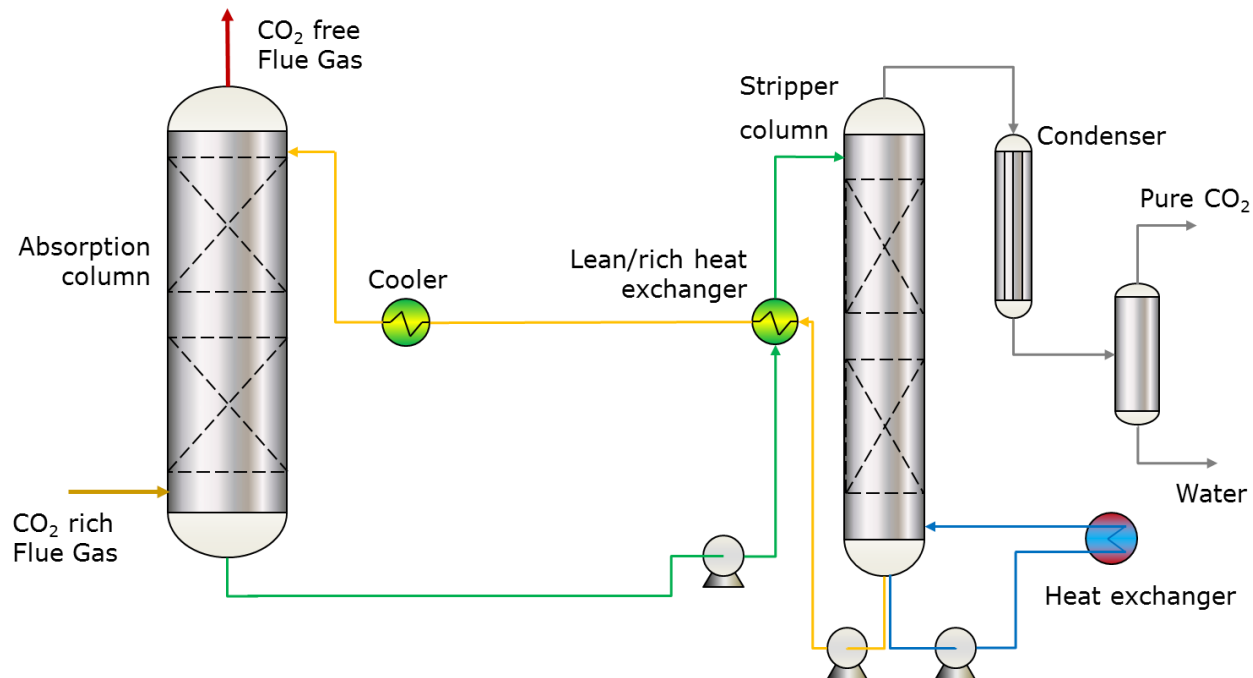
CO₂-capture, polishing and storage

- CO₂-absorption Galloxol®
2,2 – 5,5 ton per hour
- Heat integration

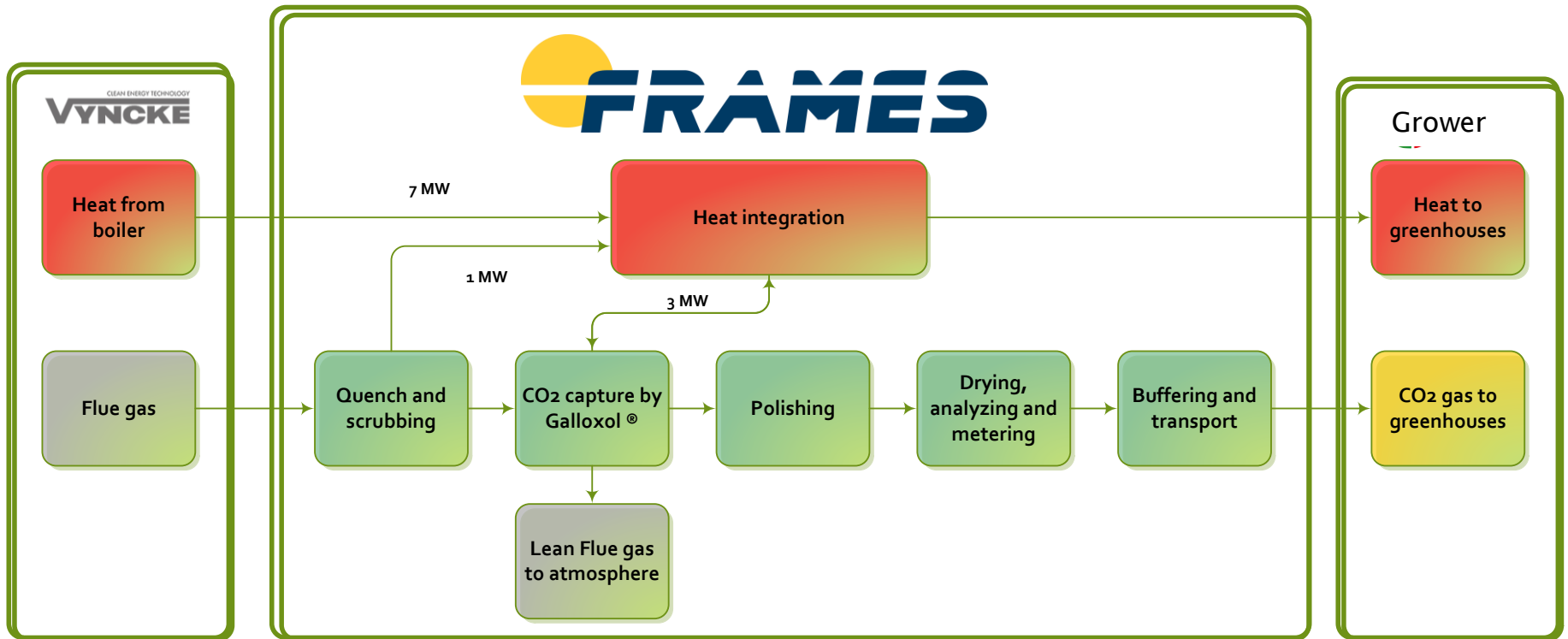


Frames Galloxol® CO₂-afvanginstallatie

- Niet vluchtig CO₂ absorptie vloeistof
- Hoog CO₂-afvangsrendement zelfs bij lage CO₂ concentratie
- Thermisch gedreven proces
- Volledige integratie van de CO₂-afvang en biomassaketel
- Standaard oplossing voor de tuinbouw, klant specifieke ontwerpen mogelijk



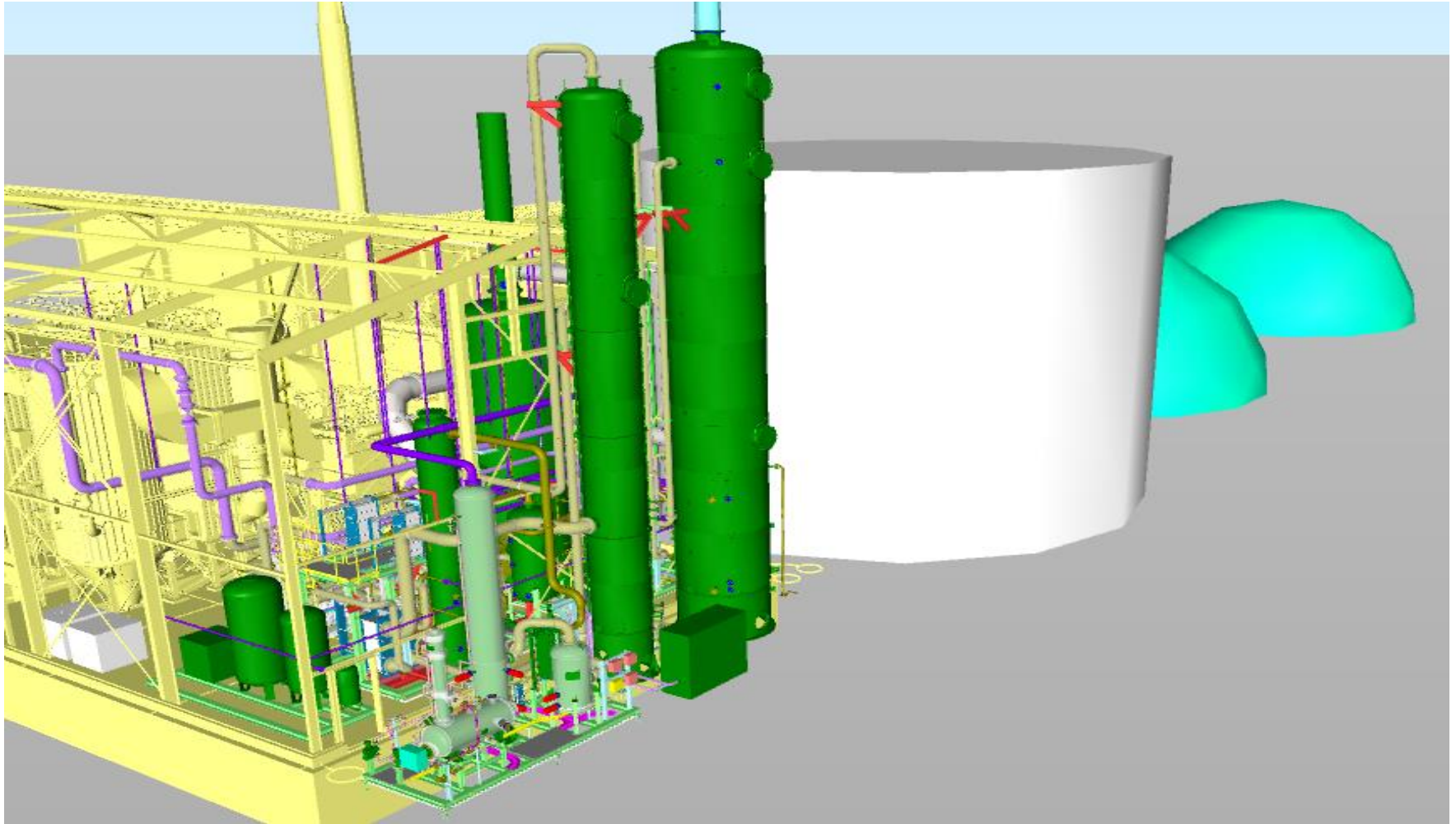
Het CO₂-afvangproces en warmte integratie



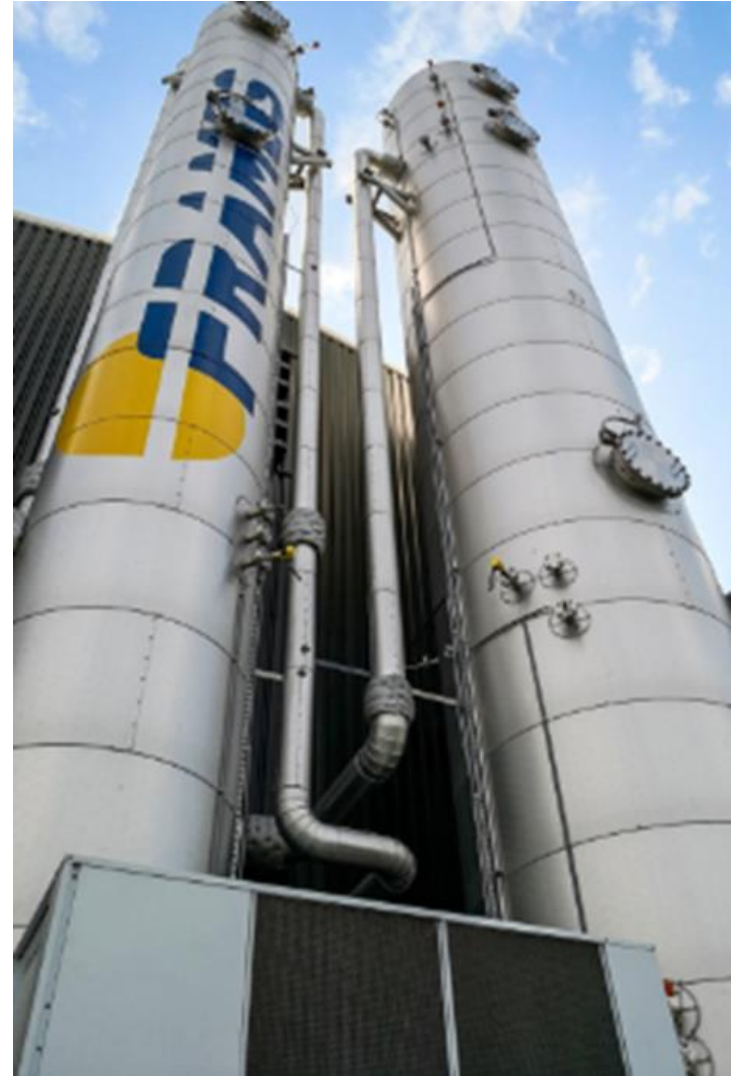
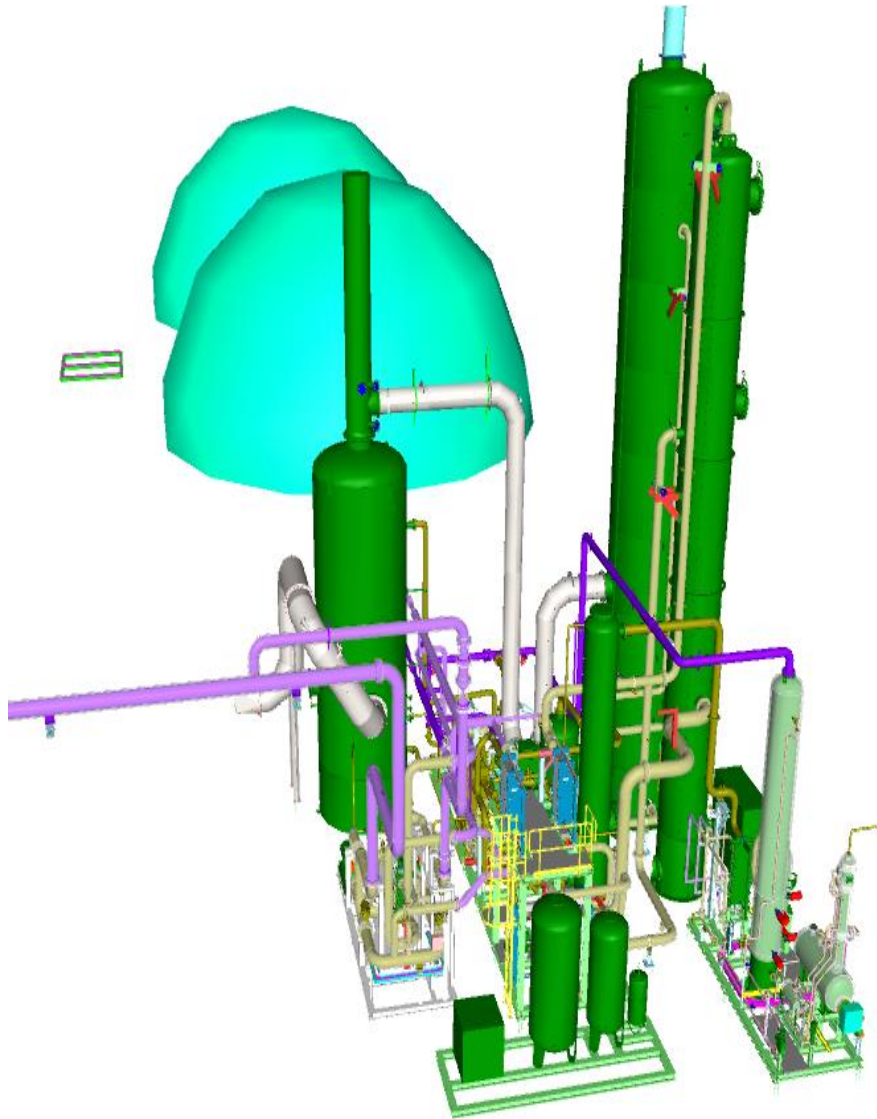
Overview CO₂-afvang project DES Sirjansland



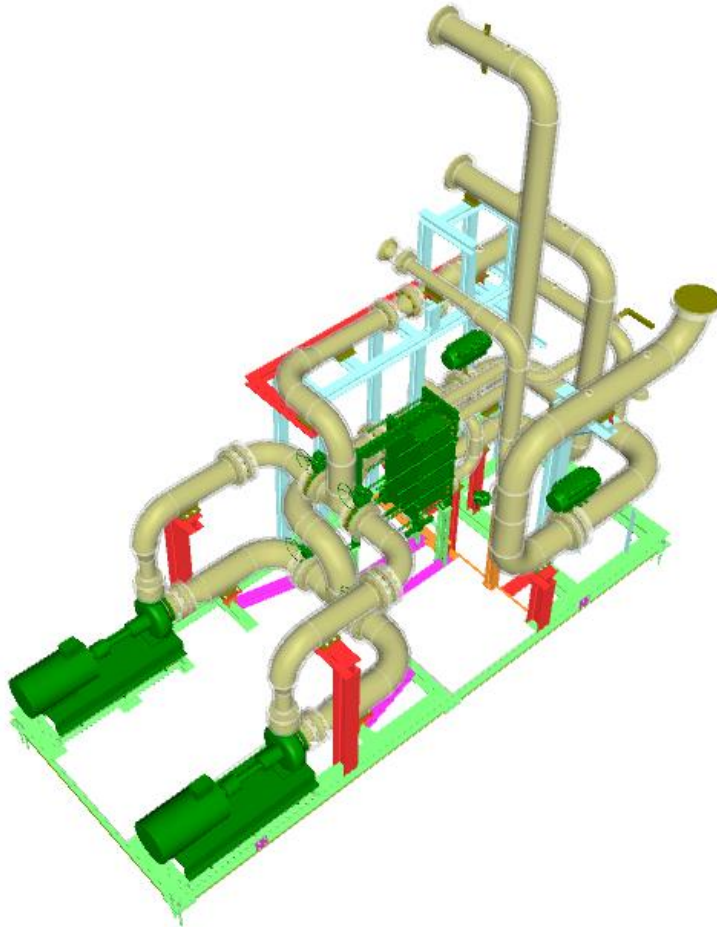
CO₂-afvang uit rookgassen van de glastuinbouw



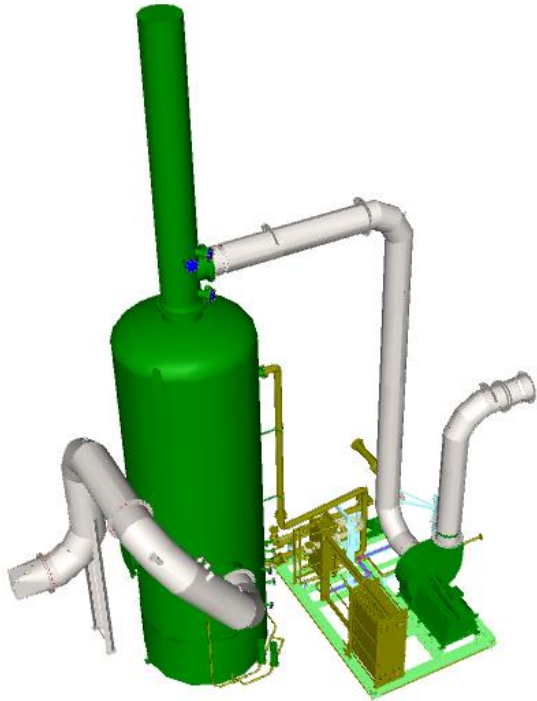
Overview



Warmte integratie



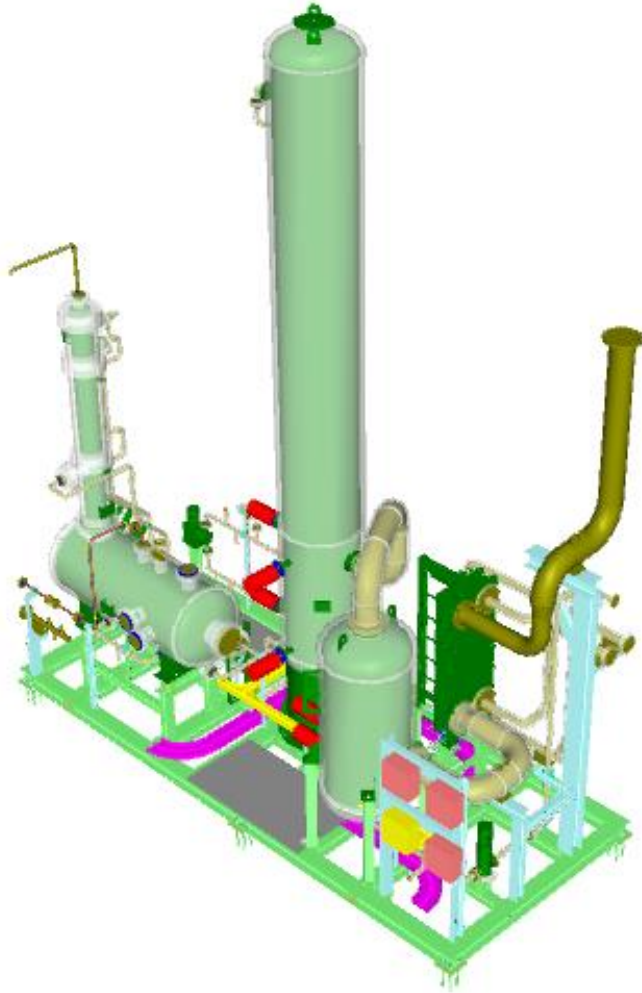
Rookgas koeler/condensor en blower



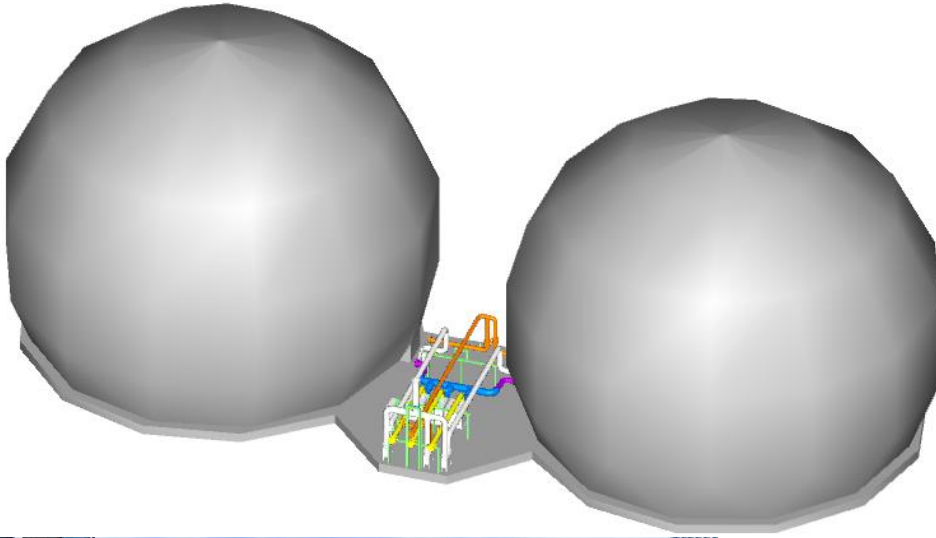
CO₂ capture system



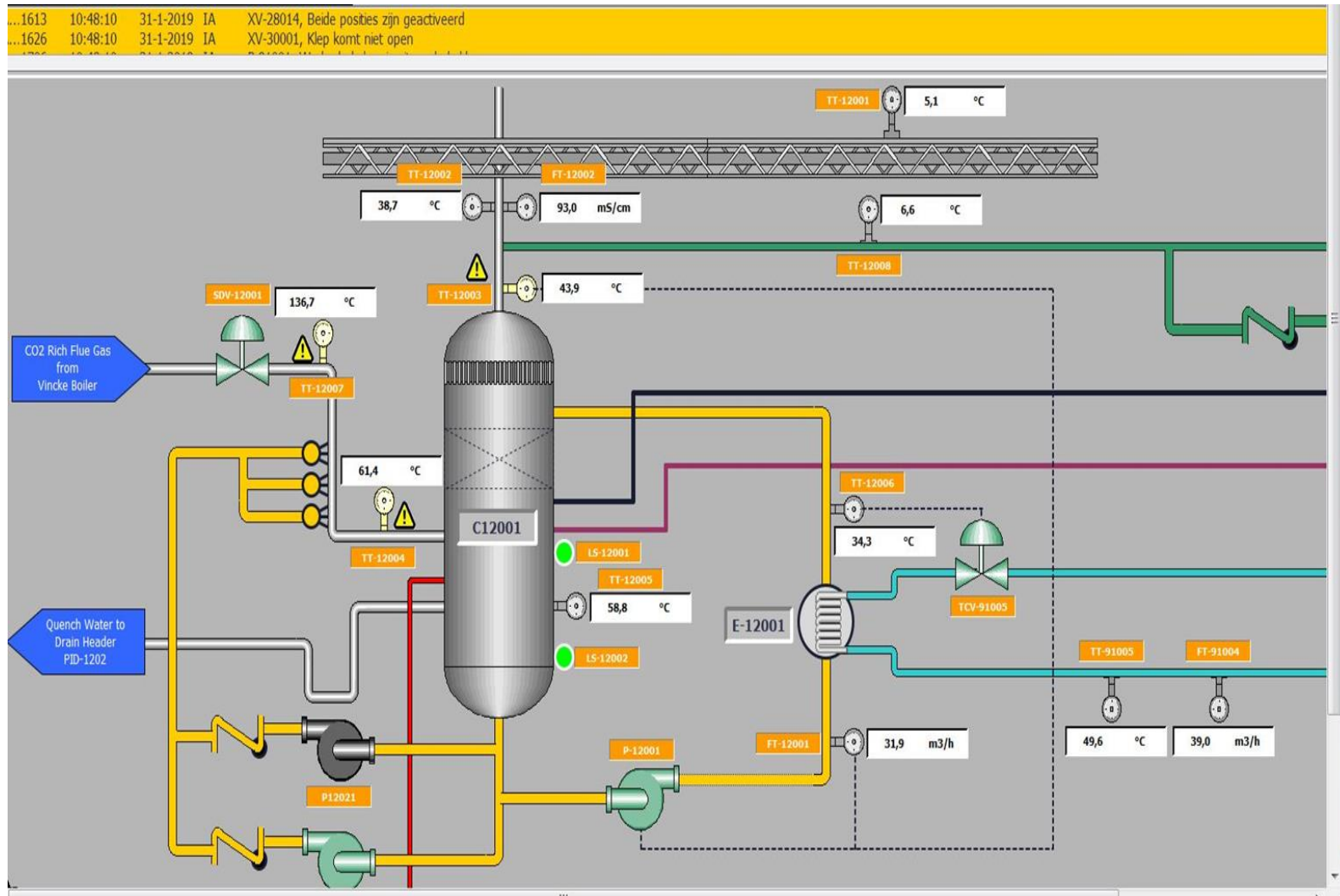
CO₂ droging & polishing



Buffering & transport

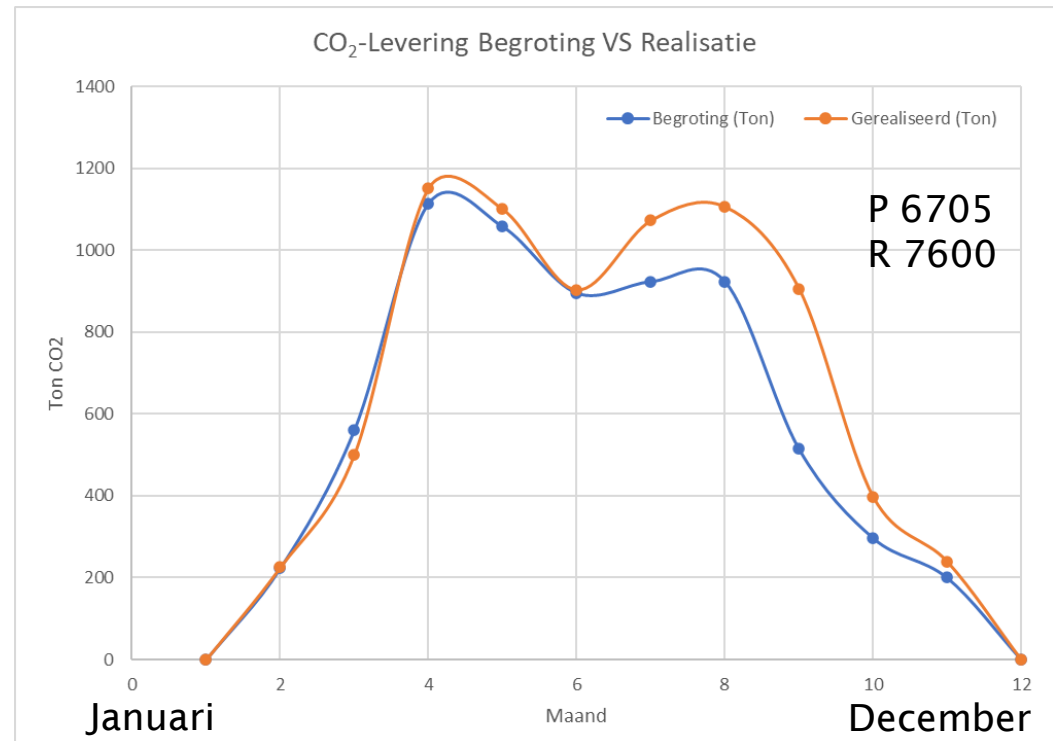


Remote monitoring & control

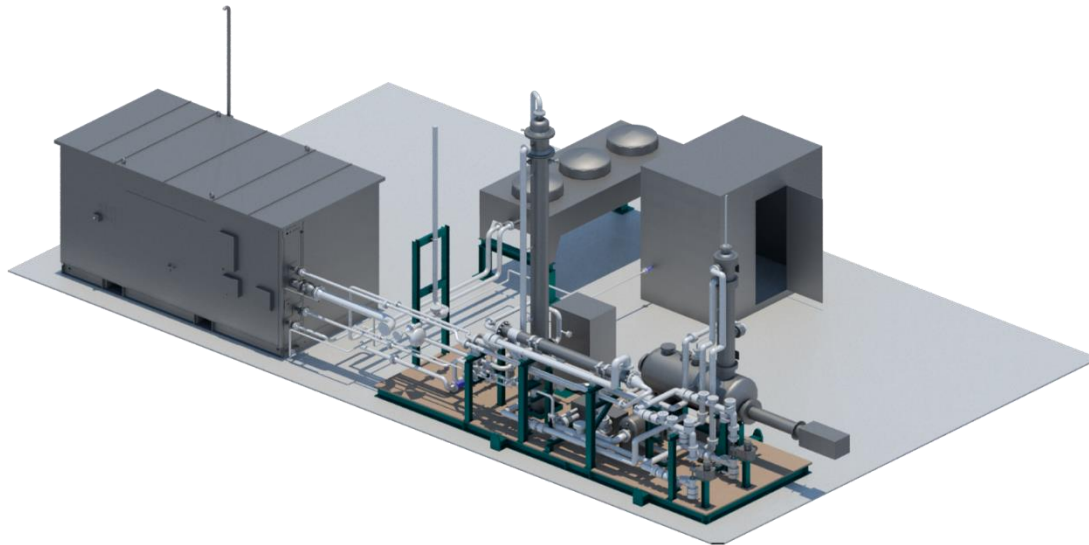
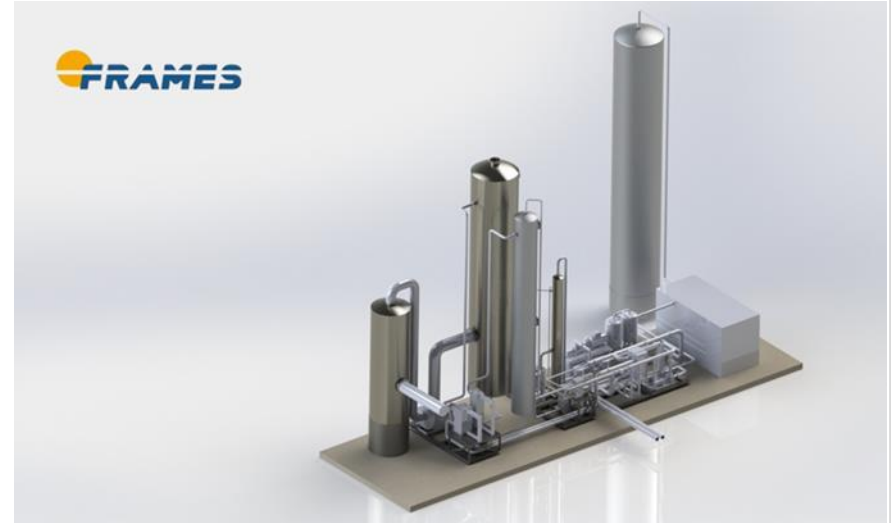


Ervaringen met de DES Installatie

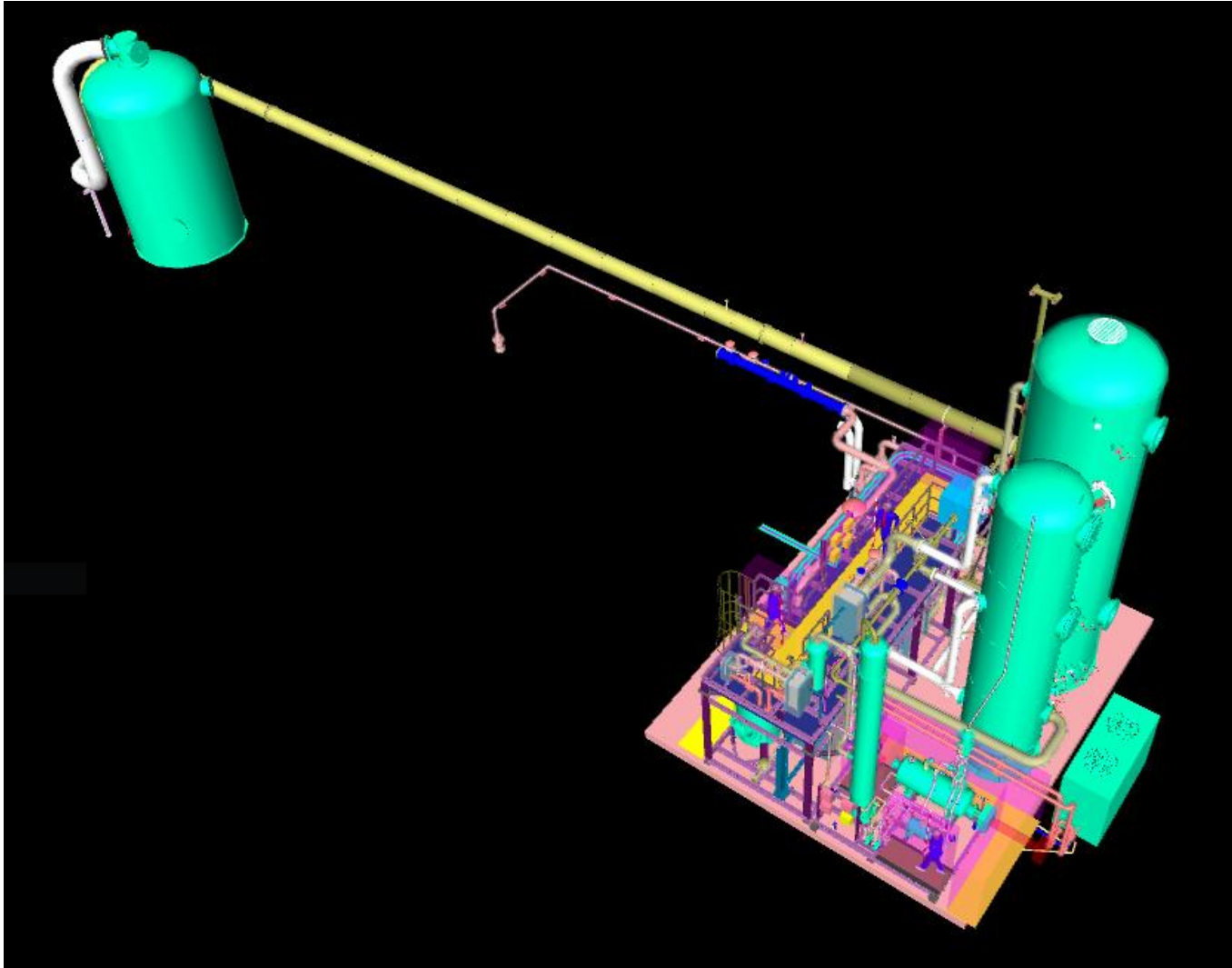
- Bijna 3 seizoenen in operatie, hoge beschikbaarheid en groeiende
- Proces werkt zoals verwacht, design validatie is afgerond
- Integratie van de CO₂-afvang en biomassaketel werkt goed
- Toekomst, meer uren draaien en uitbereiding CO₂-opslag



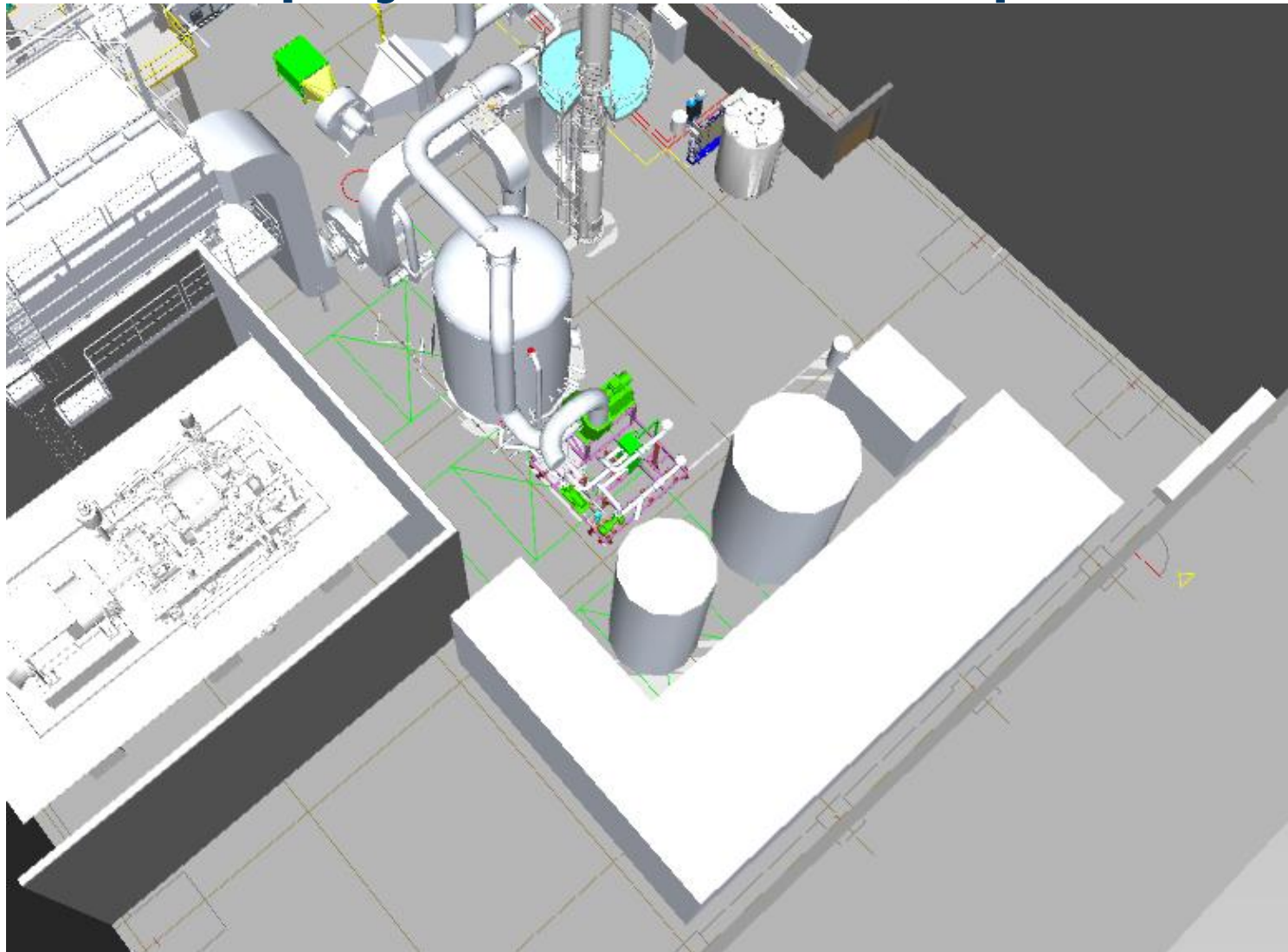
CO₂ compressie en vervloeiing



3D model project in aanbouw



3D model project in aanbouw (Capture ready)





DES





**Thank you for
your time!**

