



ITI Energy Limited

A New Era in Gasification

Presentation

to

UK Energy Symposium

Nottingham

14th October, 2010

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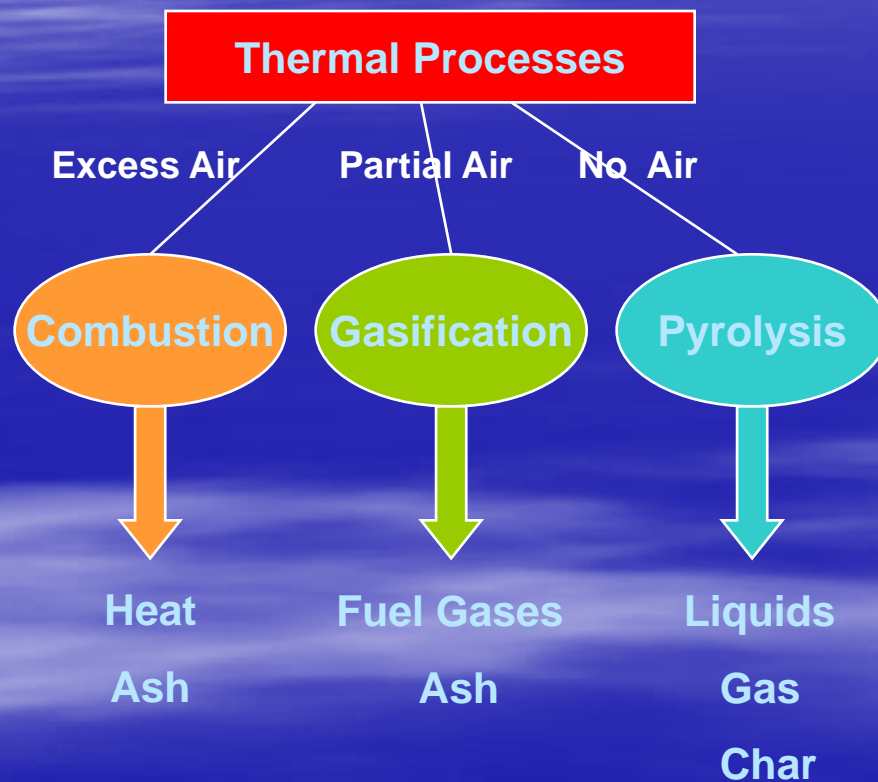
PROCESS INTENSIFICATION & MINIATURIZATION

- Reduction of process plant size by 10 -100 fold
- Reduced capital & operating costs
- Reduced inventory & hazard (**supported by H&SE**)
- Safety and social acceptability (**Small size**)
- Innovative processes and products (**Lower emissions**)
- Environmentally friendly

APPLICATION OF **PIM** TO GASIFICATION



What is Gasification ?



GASIFICATION PROCESS

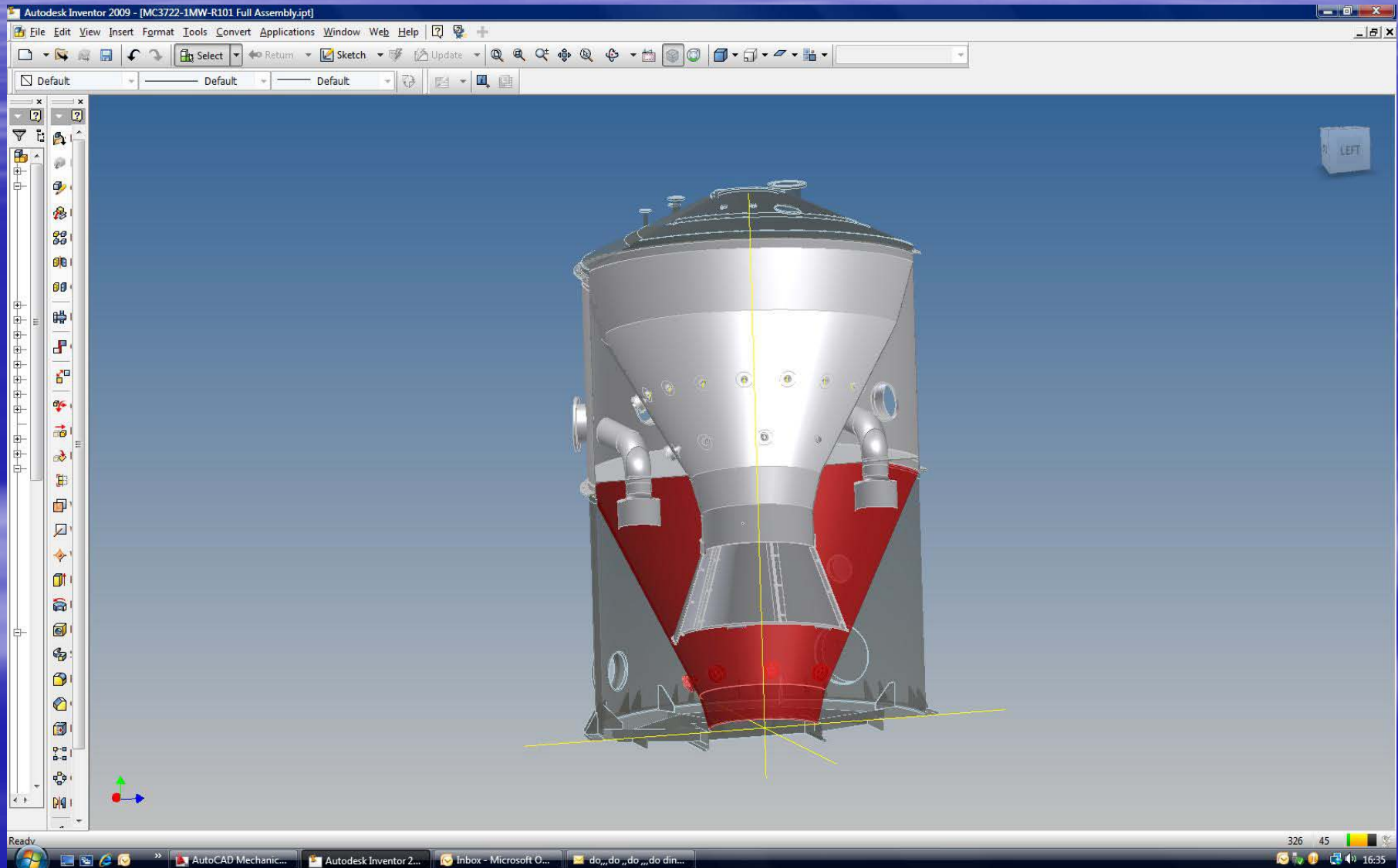
- **O₂ Limited Conversion of Biomass into flammable gas mixture for green energy generation.**
- **Solid Fuel + 1/2Air → Gas**

ITI Energy Gasification Process



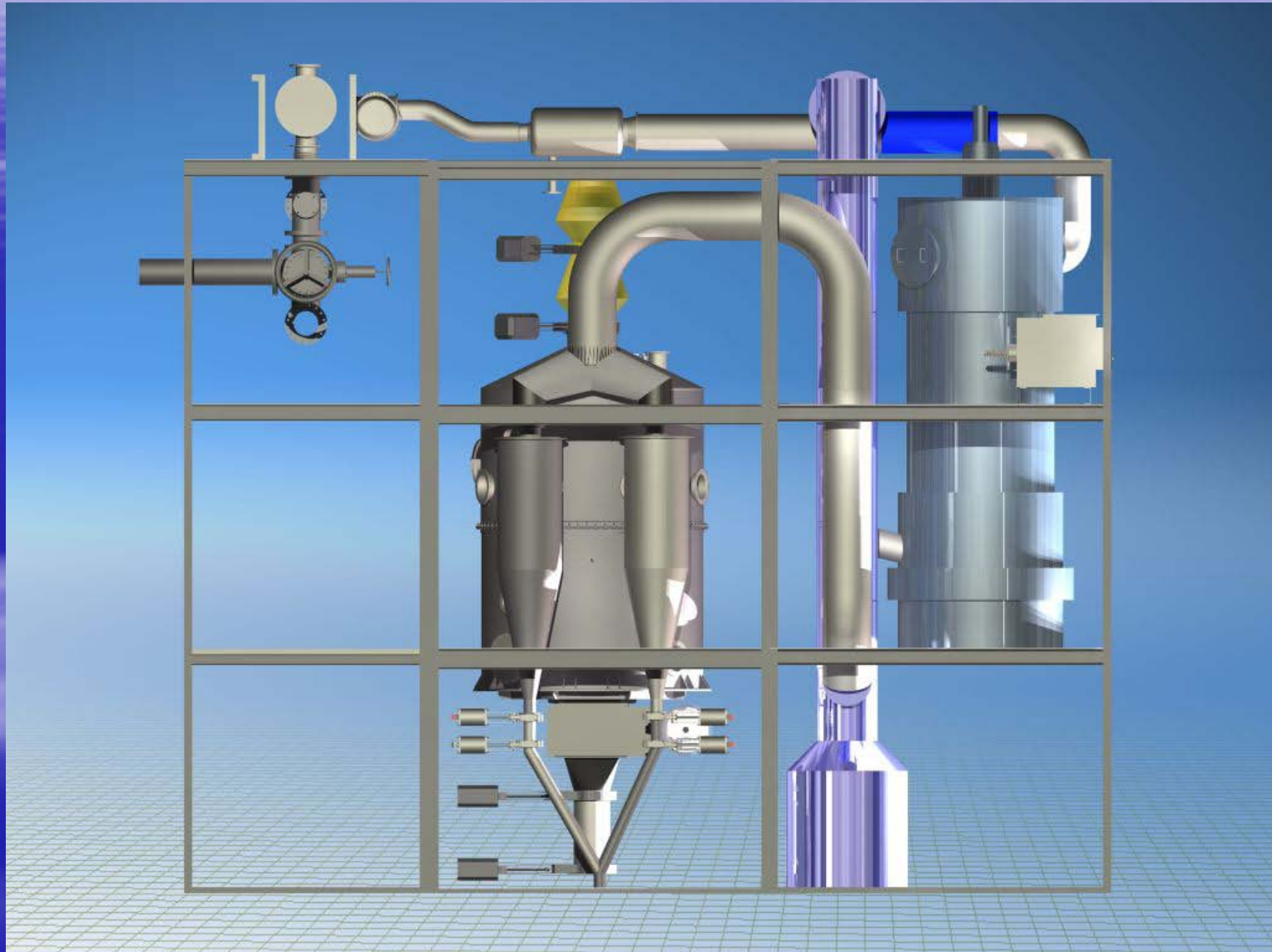


ITI Gasifier Reactor

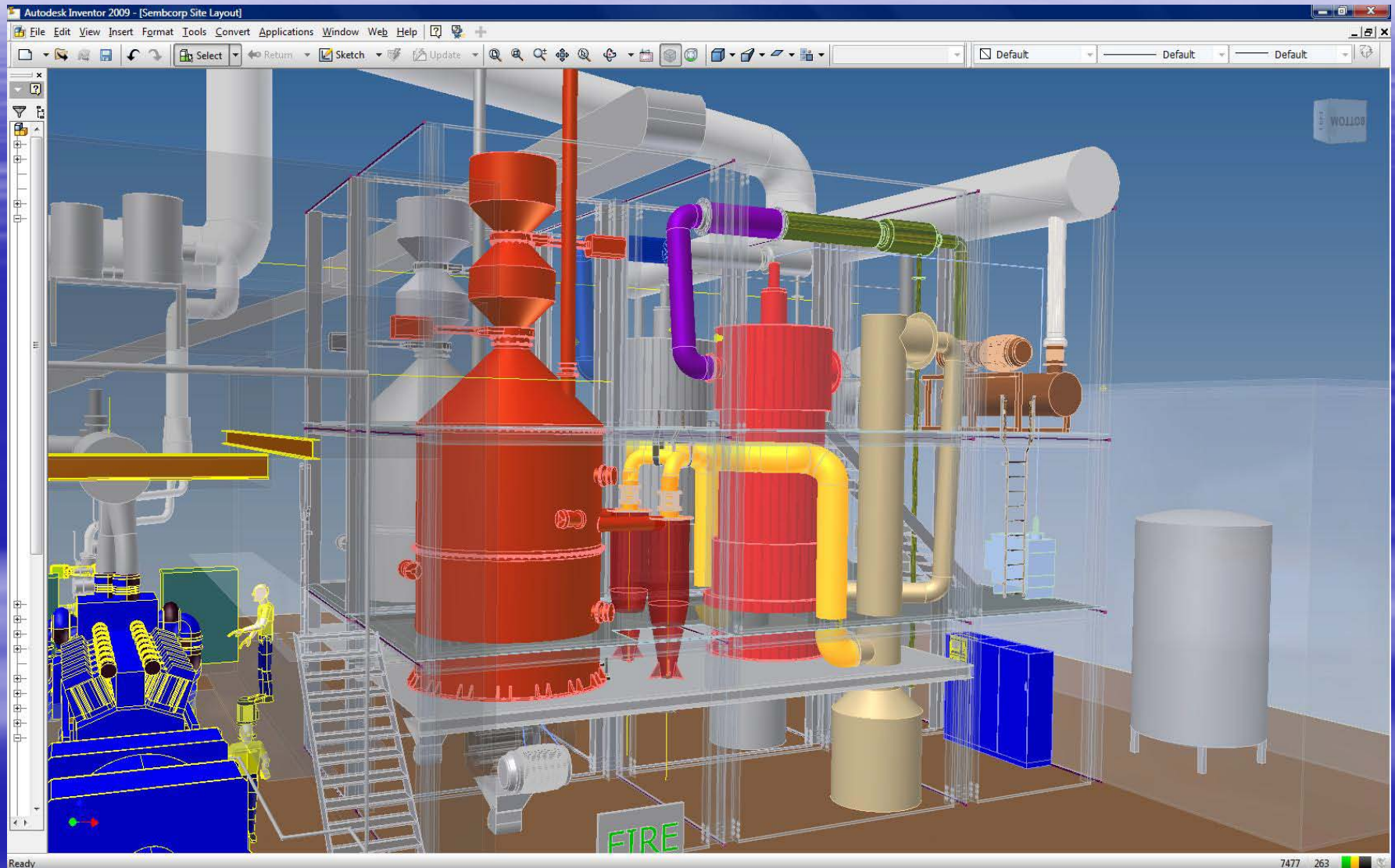




ITI Gasifier Gas Cleanup

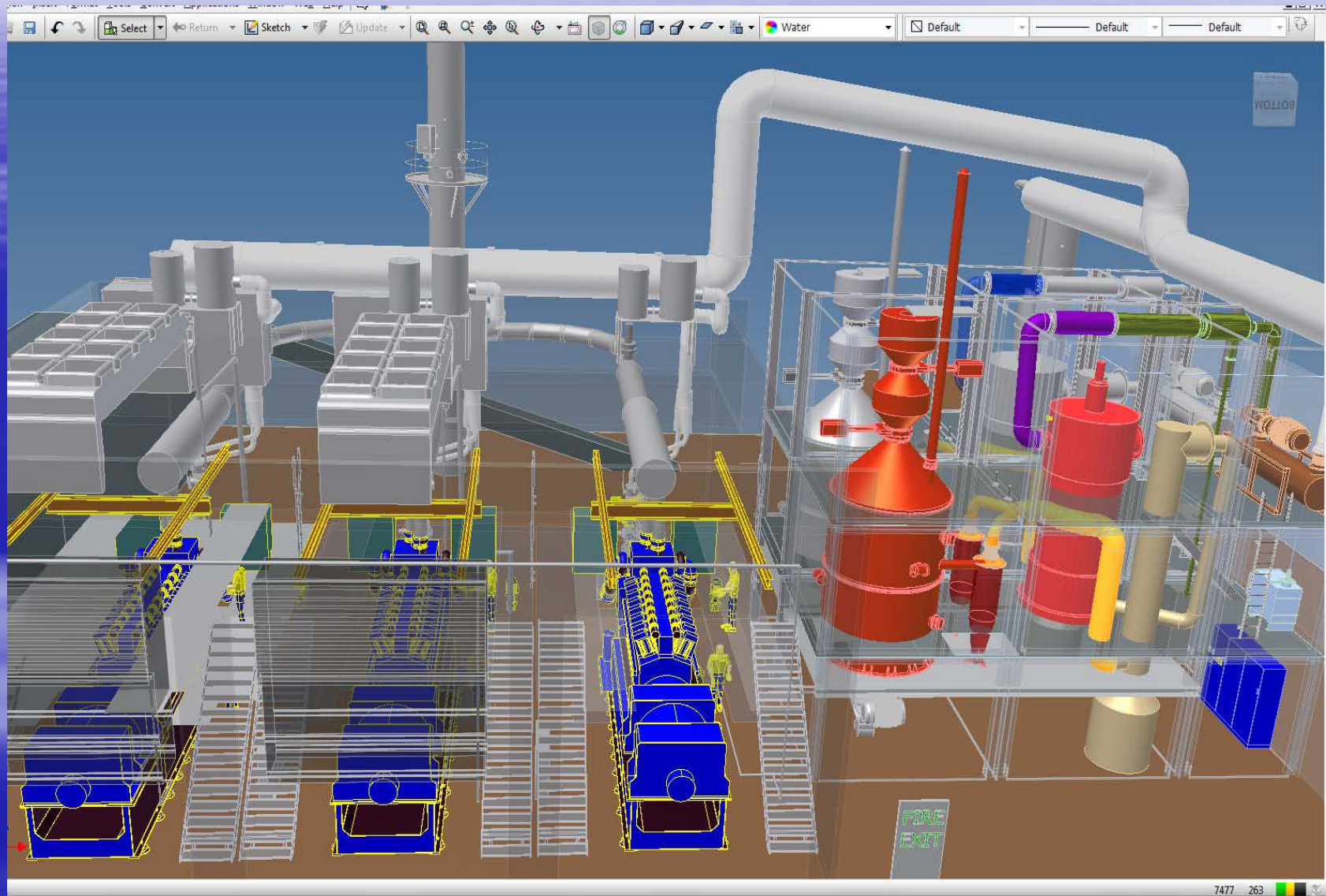


Gasifier with Gas Clean Up





Gasifier Generating System



New Generation Gasifiers



New Generation Gasifiers

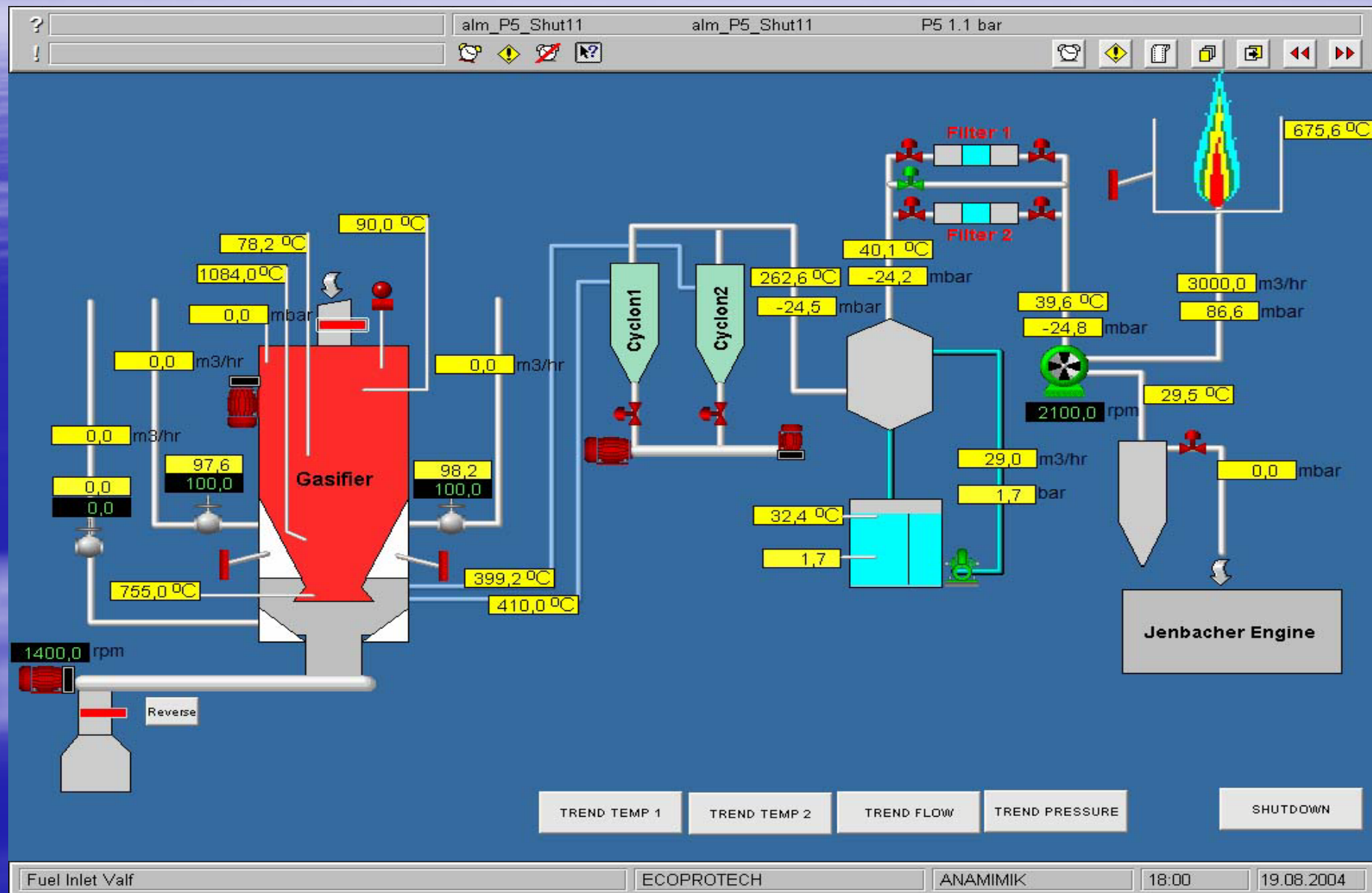


ITI GASIFIER Under Construction

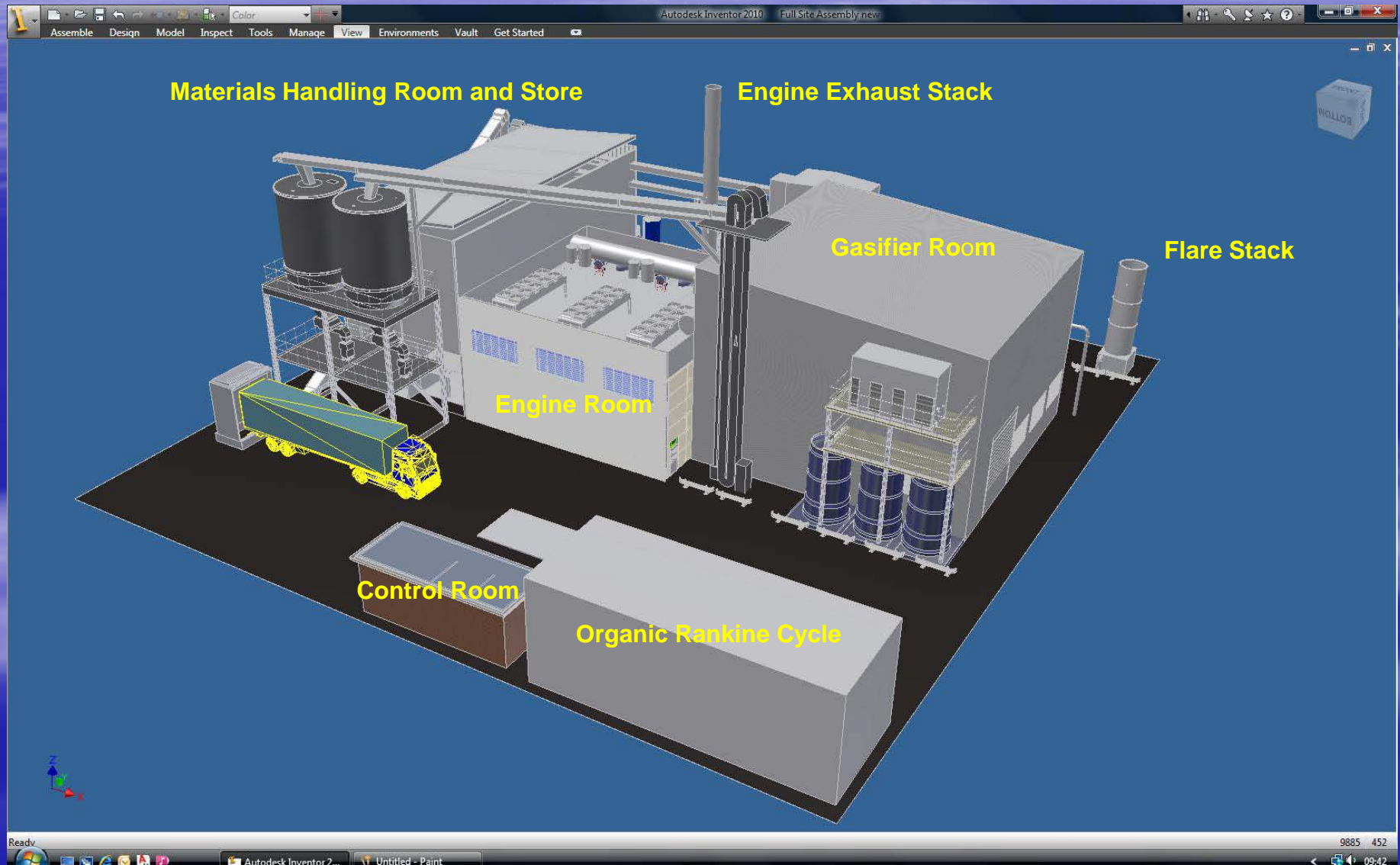
New Generation Gasifiers



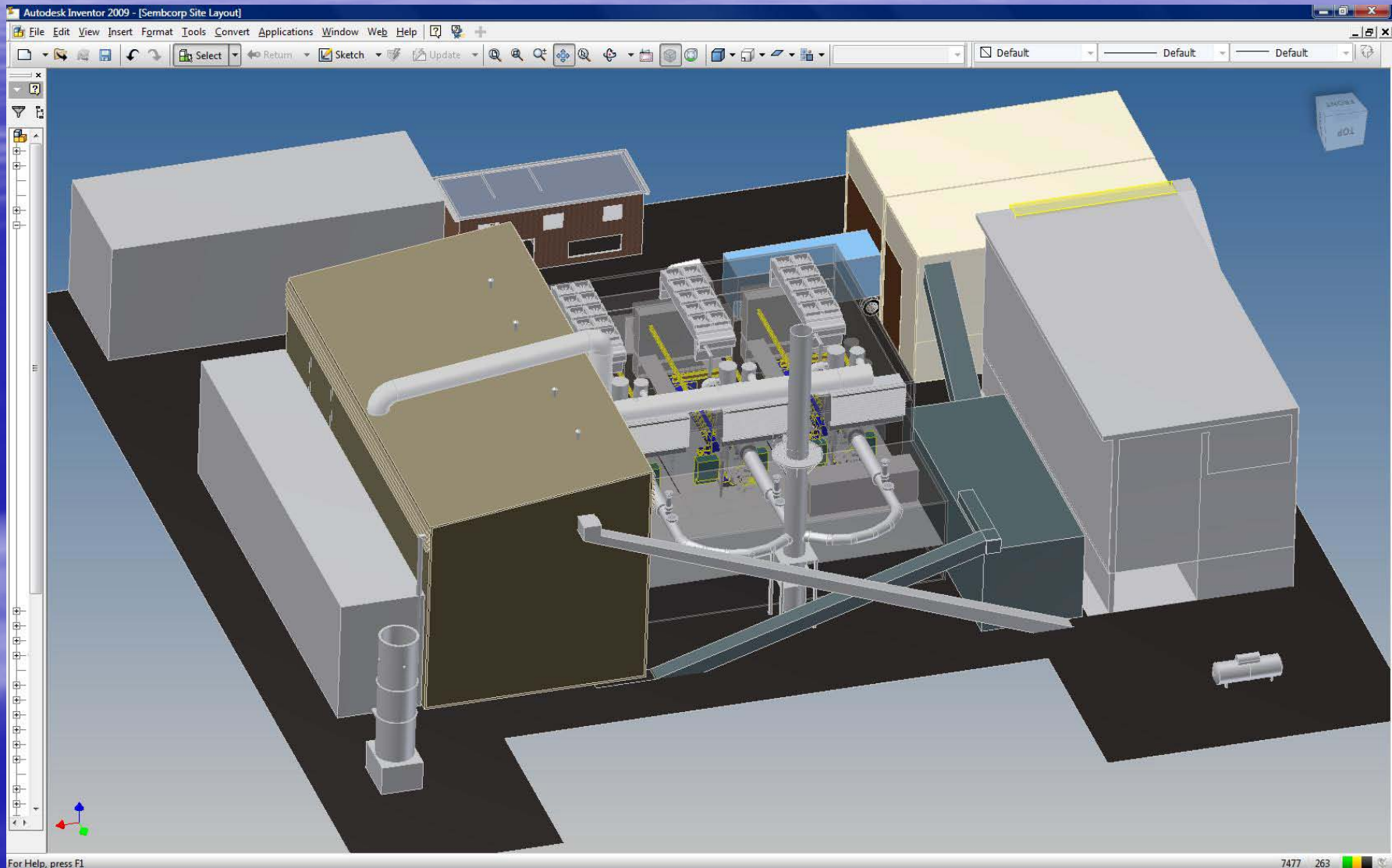
New Generation Gasifiers



General Layout for 4 Gasifier System 6.84 MWe Nett

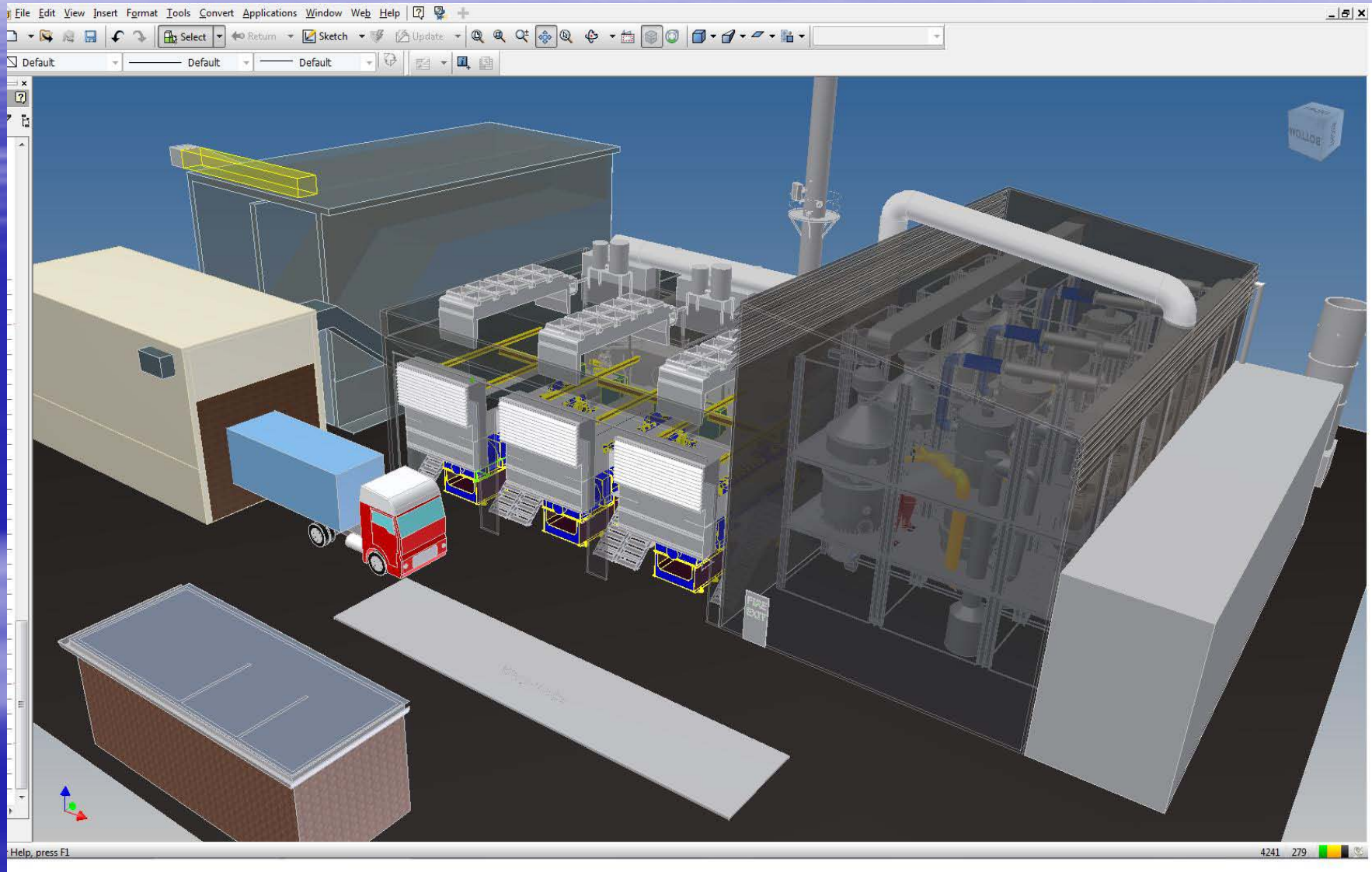


4 Gasifier Energy Generating System 7 MWe Nett





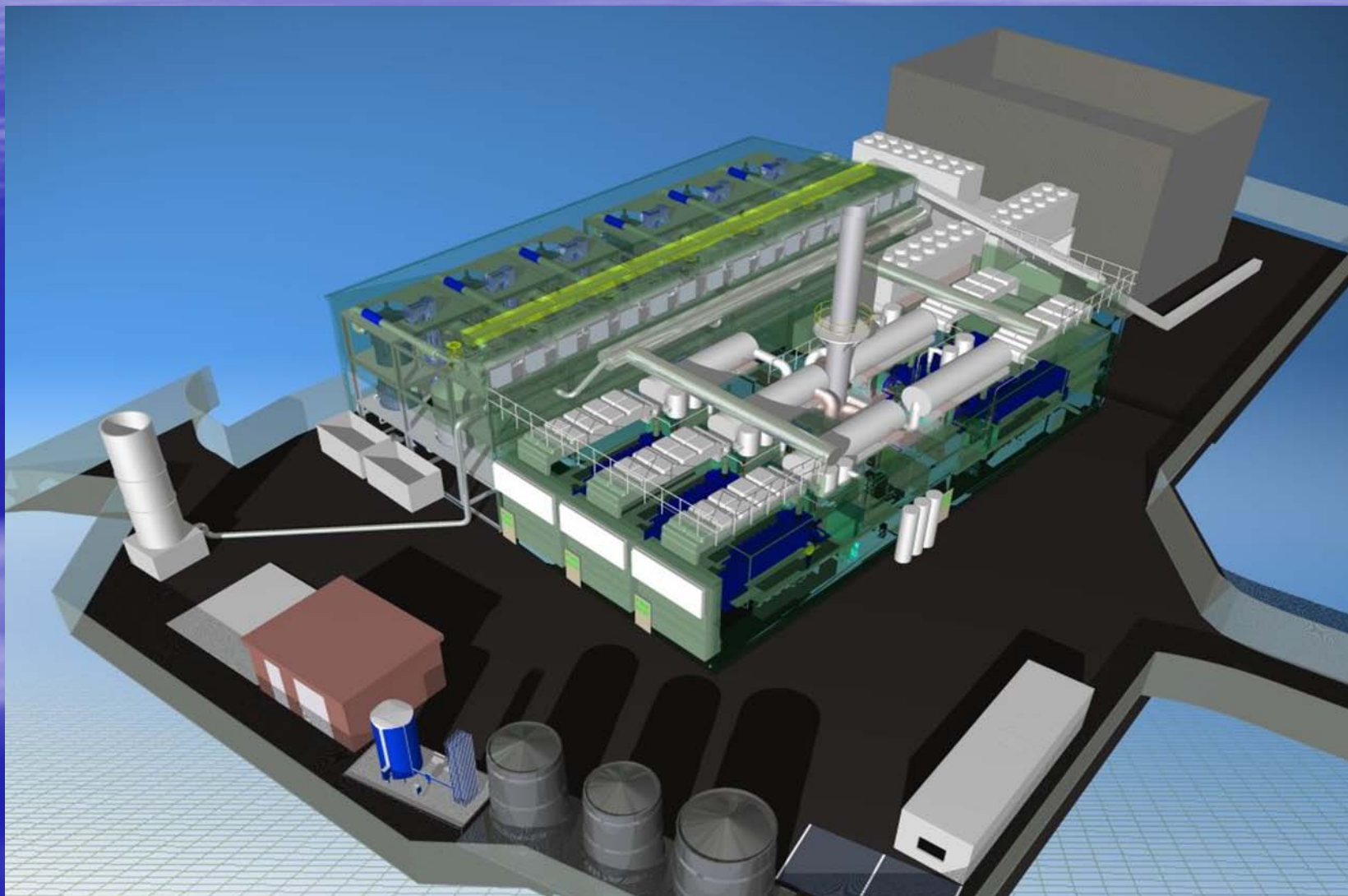
Layout for 4 Gasifier Generating System



Layout for 6 Gasifier Generating System 11.4 MWe Nett



Layout for 6 Gasifier Generating System 11.4 MWe Nett



Typical Feedstock for the New Gasifiers



The ITI Energy Gasifier processes the “WASTE OF THE WASTE”

- Wood Chips / Wood Waste
- Straw
- MSW-RDF
- Nut Shells
- Sewage Sludge
- Olive Pips
- Sterilized Clinical Waste
- Leather Waste
- Food Waste
- Petroleum Sludge
- Tyres up to 30%
- Sugar Cane Bagasse
- Miscanthus
- Energy Crops
- Oil Seed Rape Husks
- Coal Fines
- Packaging Waste
- Chicken Waste



MODULAR COMBINED HEAT AND POWER (CHP)



- Units produced in 1.9 MWe gross modules, allows easy addition of capacity as demand for increased feedstock processing or increased energy generation occurs
- Small footprint, low height, no smoke stack, clean technology allows discreet housing within a building structure
- Module has Multiple Revenue Streams
- Processes 1.5 tonne feedstock p/h – Gate-fee for negative value feedstocks – RDF gate-fees increasing rapidly due to landfill diversion targets
- Produces >1.9 MW electricity p/h gross 1.7 MWe net– Renewable energy attracts ROCs / LEC's, other subsidies depending on geography – energy costs increasing
- Produces 1.9 MW thermal p/h – can be used for process heat, or cooling using absorption chillers, district heating/ cooling or to drive steam turbine.



Typical Output from a Single ITI Energy Gasifier

- Could power 4120 homes (3.3MWh per annum*)

And save:

- 2.6 million Tonnes of carbon equivalent emissions per annum (9.8 million Tonnes of CO₂)
- Could heat 780 homes (20.5MWh per annum*)

And save:

- 1.3 million Tonnes of carbon equivalent (4.75 million tonnes of CO₂)

*Source: British Gas



Engine Exhaust - Flare Stack Emissions

Gas Composition (vol. %)	
CO	16.21
O ₂	2.62
N ₂	52.82
H ₂ O	3.15
H ₂	13.73
CH ₄	2.03
CO ₂	12.36
C ₂ H ₄	0.19
C ₃ H ₆	0.04
CV (MJ/Nm ³)	5.2
Heavy Tar	5 mg/l
Particulates	10 mg/l





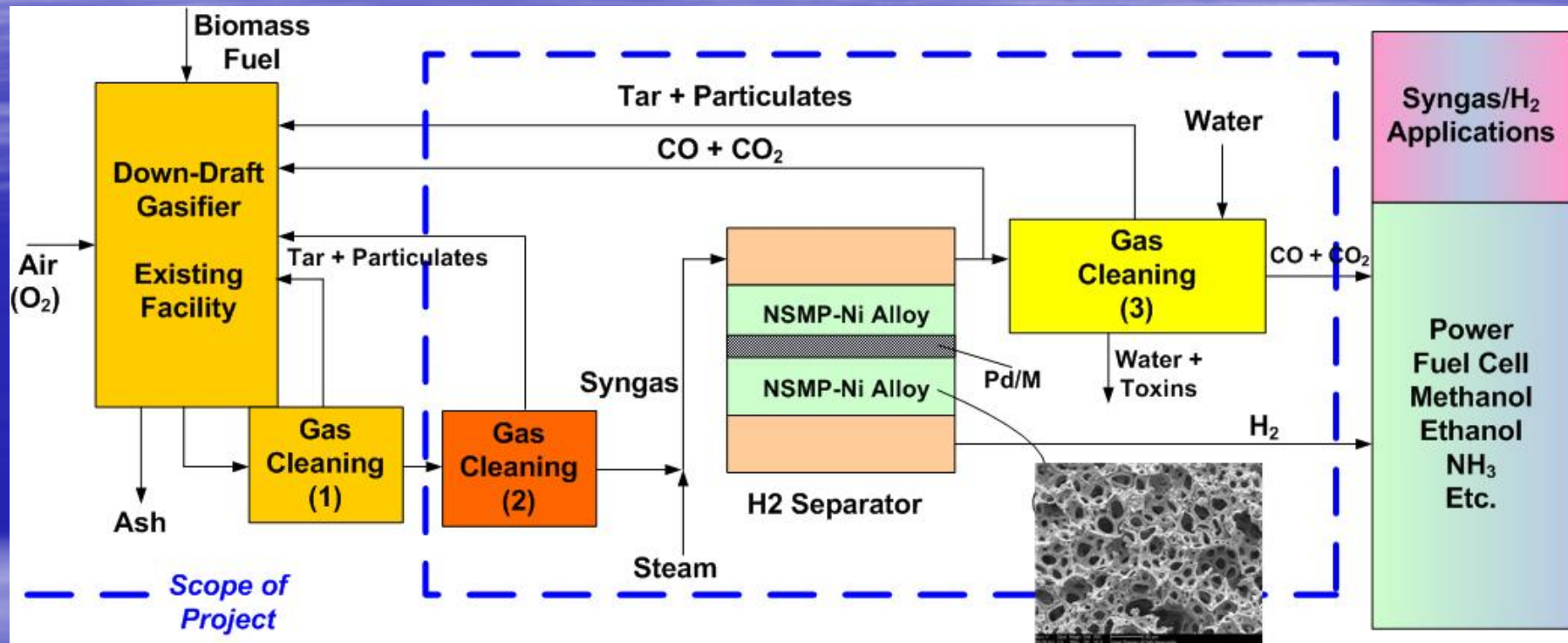
Gasifier SynGas Analysis (Before Engine)

Parameter	Measured	WID Limits
Particulates mg/Nm ³	<5	10
TOC mg/Nm ³	<3	10
HCl mg/Nm ³	<5.6	10
HF mg/Nm ³	<0.45	1
SO ₂ mg/Nm ³	<38	50
NO _x mg/Nm ³	<240	400
CO mg/Nm ³	<100	Site Specific
Total Heavy Metals mg/Nm ³	<0.25	0.5
Hg mg/Nm ³	<0.01	0.05
Cd +TI mg/Nm ³	<0.007	0.05
Dioxins & Furans ng/Nm ³	<0.002	0.1





Current Research: Syngas Cleaning and Hydrogen Separation



COPIRIDE PROJECT

Partners: Newcastle Uni.; ITI Energy; IMM-Mainz ,Germany
Funding : EPSRC / EU; Carbon Connections

Current Research: OxyGasification



The New Gasifier Features the Following



- Oxygen enriched air is used as oxidant (instead of air) without an external air enrichment facility.
- The use of enriched air and ultimately, pure air will reduce the size of the gasifier system, including that of the reactor and gas cleanup while increasing the CV of syngas.
- Gasifier utilizes several new materials developed in conjunction with Newcastle University in the enrichment process.
- Gasifier also works with air.
- The performance of the gasifier (CV, outlet temperature, tar and particulate levels) can be controlled more effectively and bridging/fluctuations in gas quality are suppressed.
- Syngas composition can be controlled (especially CO/H₂ ratio) so that the syngas quality is suitable for gas-to-liquid fuel conversion.
- Gasifier can be used to produce pyrolysis oil.
- A patent application has been applied for.
- The patent includes the materials production, air enrichment as well as hydrogen and oxygen separation membranes and syngas cleaning.
- This equipment will be used in the EU Copiride project for the direct synthesis of ammonia from syngas using a novel process route.



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