High quality Euro-5 fuels production technology and equipment

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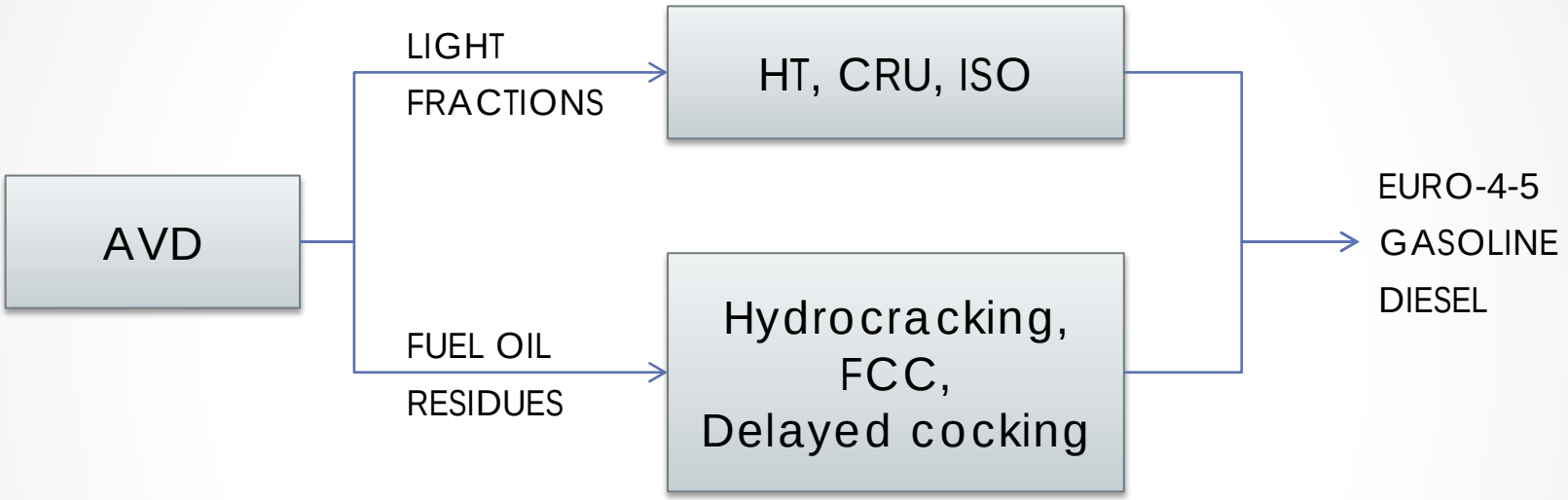
Oil refining issues

- Heavy and extra heavy crude oil as feedstock
- High sulfur content
- Strict environmental requirements
- High quality petroleum products demand
- Distributed oil fields and wells

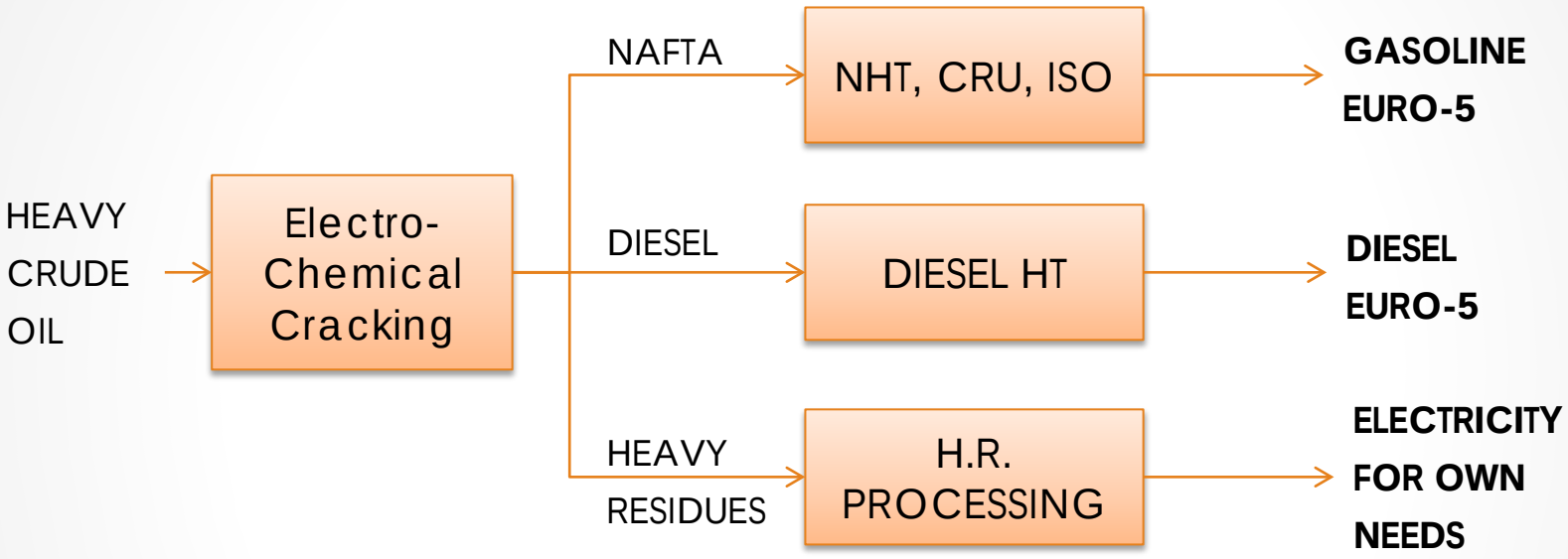
Existing solutions



- Non-economically viable*
- Oil refining depth – 70-85%

* For facilities less than 1 million tons annually

Hood River's Solution



- Economically viable for small refining capacity
- Oil refining depth – 90%

Detailed Description

Primary crude oil processing

Electro-Chemical Cracking

Electro-Chemical cracking technology allows to produce up to 90% and more of light fractions, including maximum yield of diesel fraction 160-360 °C in one stage without additional hydrogen usage during oil refining.

Electro-Chemical Cracking

Electro-Chemical Cracking

Electro-Chemical equipment includes:

- Reactor unit
- Cracking unit
- Diesel hydrotreating unit
- Heat recovery unit

Electro-Chemical Cracking

Electro-Chemical cracking system:

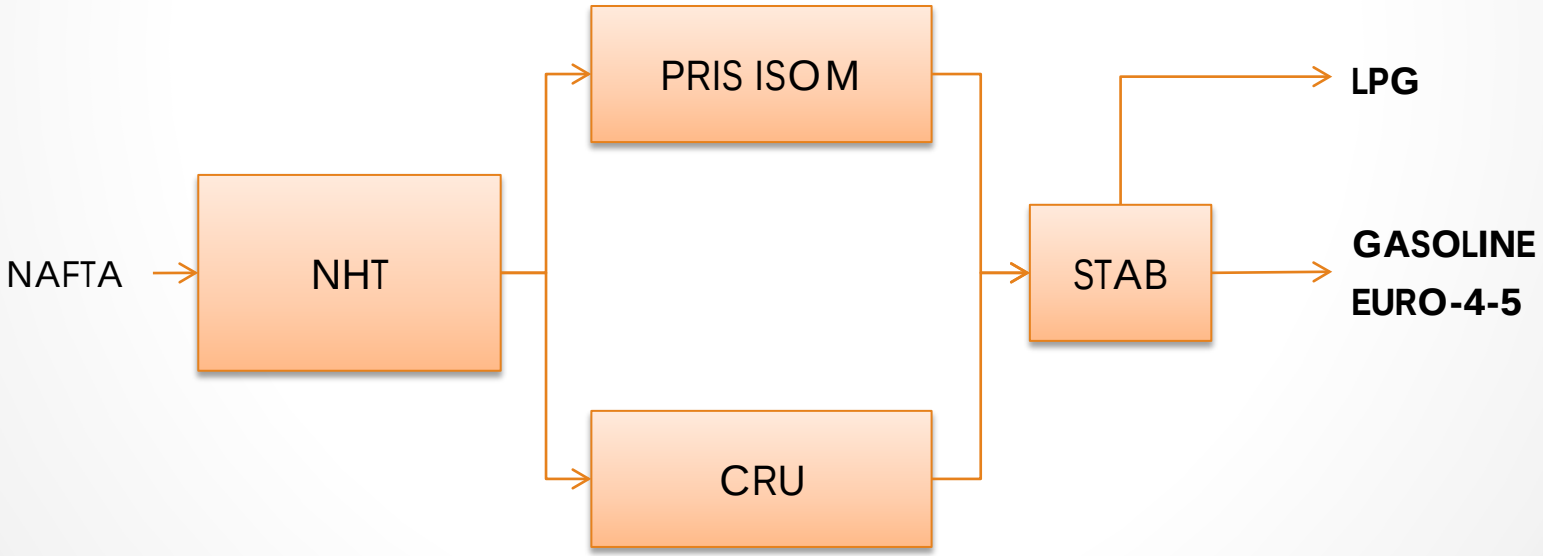
- modular building (14*6*6 meters)
- heat recovery unit, including heat exchangers and condensers
- instrumentation and control equipment
- common base, safety system and oil leaks protection
- doesn't need any basement

Detailed Description

Secondary crude oil processing

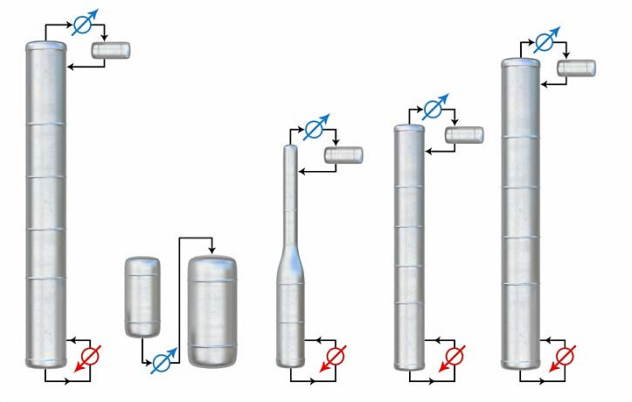
Euro-5 Gasoline

- Combined hydrotreating system for light and heavy nafta
- Combined process for products stabilization
- Energy efficient technologies



PRIS Isomerisation

TRADITIONAL ISOMERIZATION



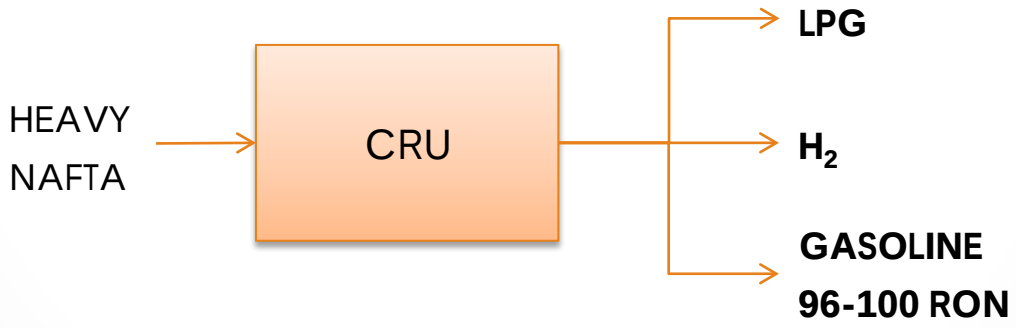
PRIS

PRIS technology benefits:

- reducing CAPEX by 2x
- decreasing OPEX by 5x
- high quality gasoline compounds (RON 90-91)
- long life catalysts (up to 10 years)

CRU (Catalytic reforming unit)

- low pressure (15 bar) → low CAPEX
- high yield (up to 90% and more) → rapid payback period
- no need in additional H_2 generation unit
- long life catalysts (up to 10 years) → low OPEX



NHT & DHT

Nafta hydrotreating and diesel hydrotreating units benefits:

- low pressure (max 55 bar)
- long life catalysts (up to 10 years)
- high quality gasoline (< 1 ppm S)
- high quality diesel (< 10 ppm S)

Oil refining costs

External utility consumption per 1 ton of crude oil*:

- electricity: self-generated
- steam: self-generated
- water: 6,1 cubic meters

Crude oil processing cost per 1 ton of crude oil**: USD 54,-

* Depends on type of feedstock

** According to our data processing cost in Russia varies from $54 to $60/ton

Hood River's Solution Benefits

- high quality fuels production according to Euro-4-5
- heavy crude oil refining
- 100% of feedstock processing
- autonomous and energy independent units
- turn-key supply
- modular design with scaling up possibility
- multi-feedstock design