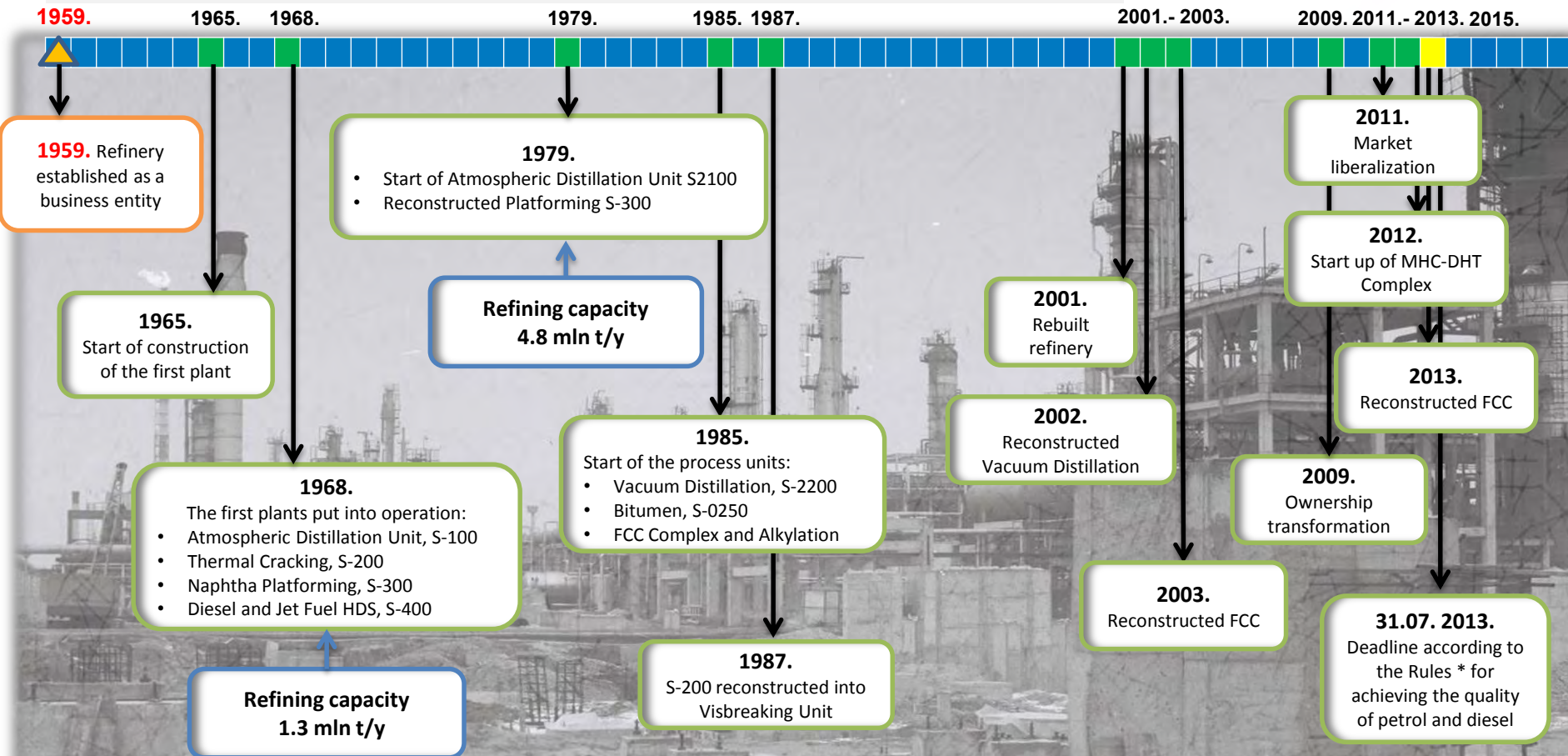


Oil refinery Pancevo – Modernization programme

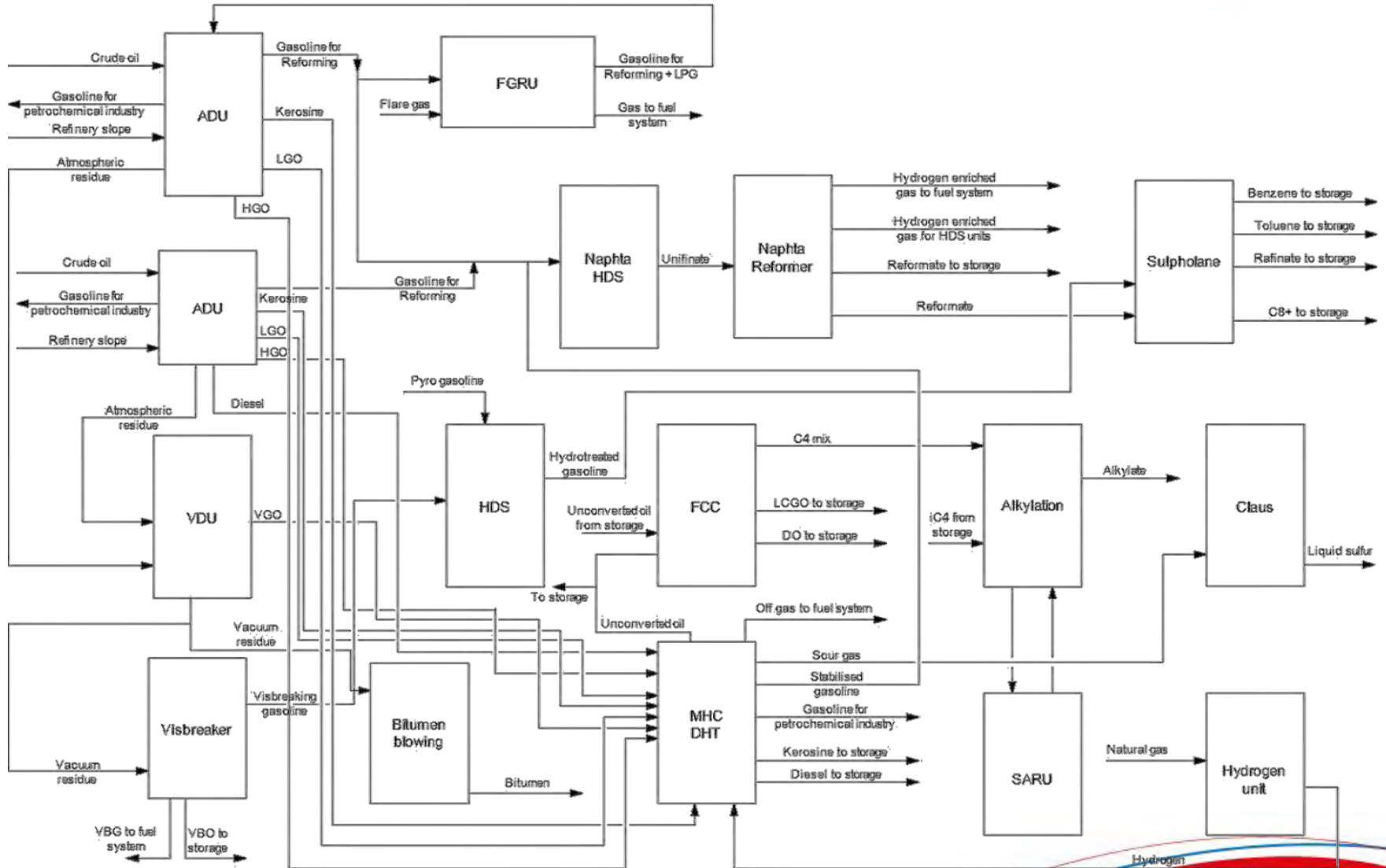
March 2017
Vladimir Gagic, NIS, Refinery

History of refinery



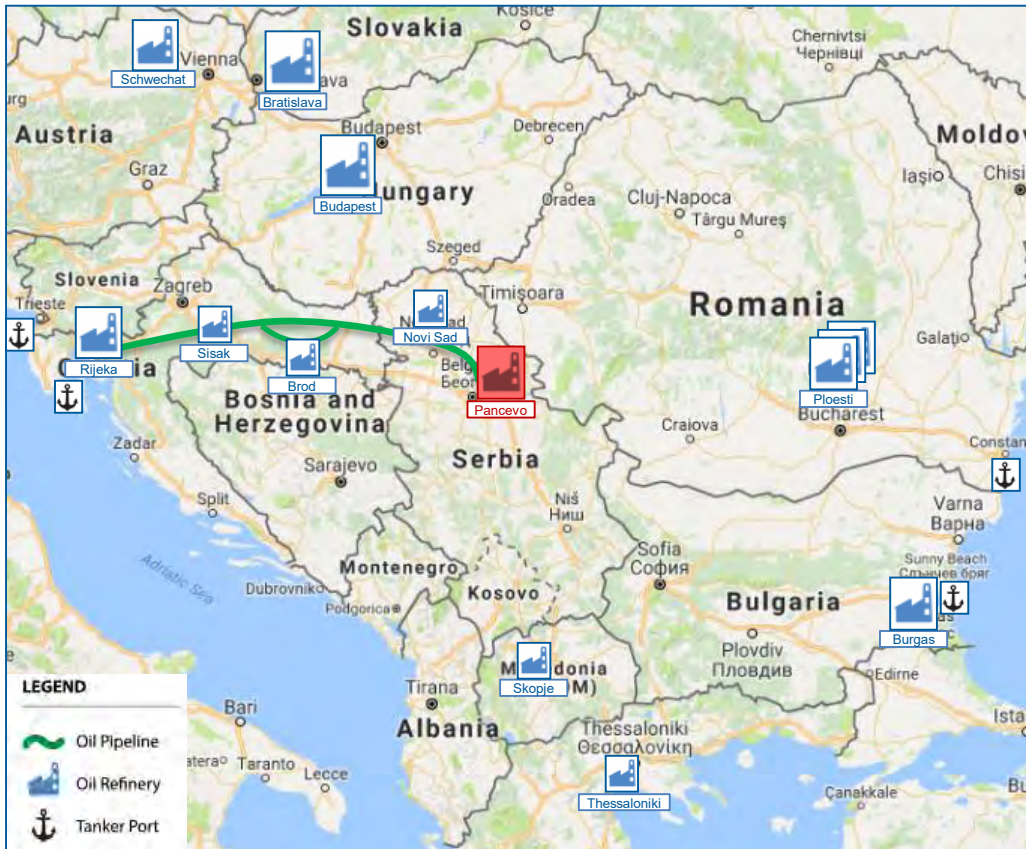
*Rules on technical and other requirements for liquid fuels of petroleum origin Fig. Gazette of RS, no. 123/2012 of 28/12/2012

Refinery block flow diagram



Oil Refinery Pancevo

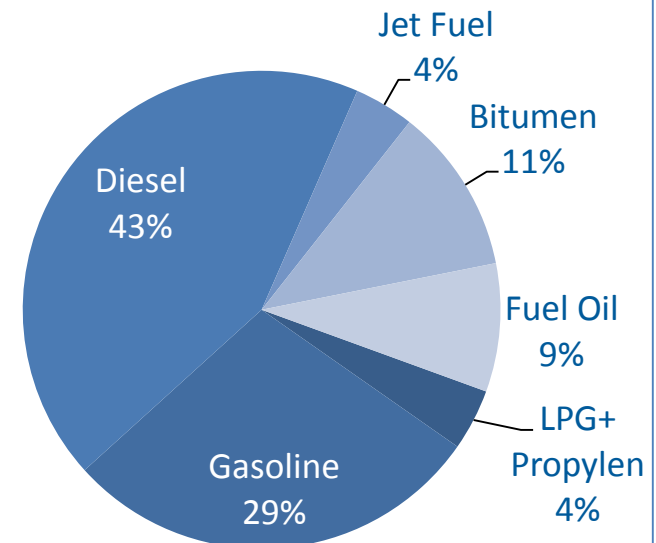
Location/Crude/Products



Crude processed:

- REBCO
- Domestic crude
- Kirkuk
- CPC

Production structure



Refinery Capacity: 4,8 Mt

Location: 15 km from Belgrade

Petrochemical complex in neighborhood

Key investments



Refinery modernization 1st phase (till 2012)

Mild Hydrocracking Complex (MHC) [completed]

Refinery modernization 2nd phase (till 2019)

Delayed Coker Unit (DCU) [in progress]

MHC Complex [completed]



Scope

- Mild Hydrocracking complex
- Hydrogen Generating Unit
- Sulphur recovery unit
- Amine regeneration unit
- Sour water stripper unit

Effects

- Increased yield of the diesel and petrol
- Improved quality of the products
- Reduced the content of the sulphur (according to the Euro 5 specification)

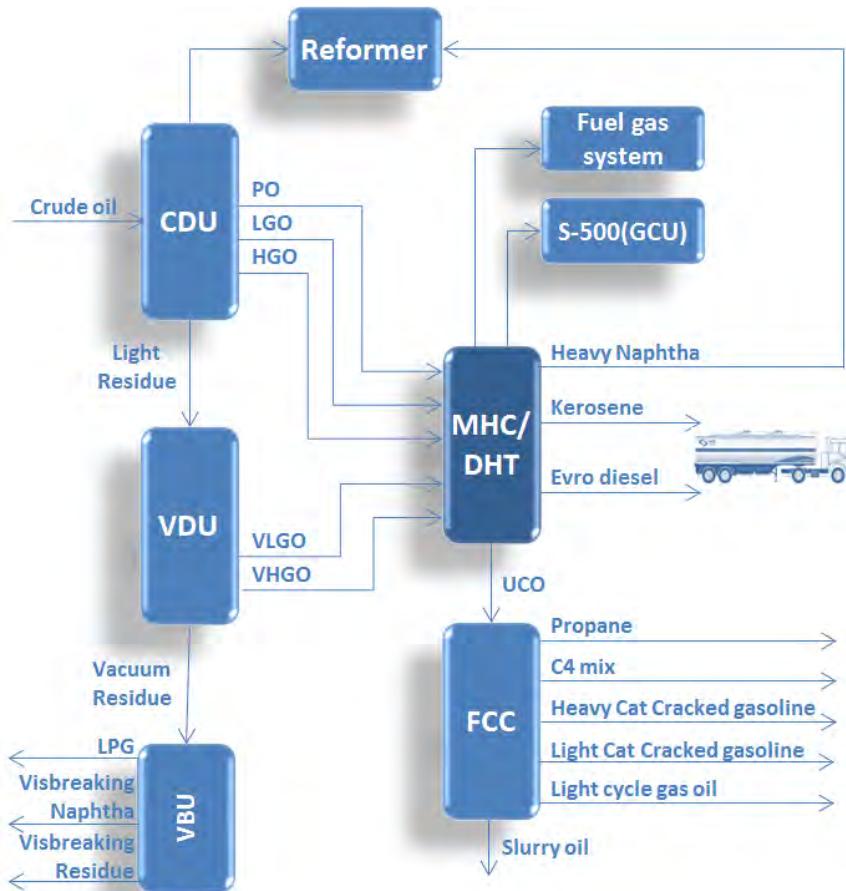
Cost/Time

Total cost: App. 500 MM EUR
Realization (EPC phase): 2009-2012

MHC Technology: Chevron
EPCM contractor: CB&I Lummus

	Before	After
Gasoline		
Sulphur, max, mg/kg	650	10
Benzene, max, % (v/v)	5	1
Total aromatics, % (v/v)	65	35
Pb, mg/l	13	0
Diesel		
Sulphur, mg/kg	10.000	max. 10
Polycyclic aromatics max, % (m/m)	not limited	11

MHC Complex [completed]



MHC/DHT FEED

- Kerosene, Light & Heavy Gas Oil from Crude Distillation Unit
- Vacuum Heavy & Light Gas Oil from Vacuum Distillation Unit

KEY FLOWS

- Unconverted Oil: Feed to FCC unit
- JET fuel
- Euro Diesel

MCH: Realized fully in line with NIS refining development strategy

Mild HydroCracking (MHC)/ Distillate HydroTreating (DHT)



- MHC/DHT complex: 23 process units and objects
- License (MHC): Chevron
- EPCM contractor: CB&I Lummus
- Start up: December 2012

Hydrogen Generation Unit (HGU)



- Hydrogen production based on steam reforming technology of the natural gas and light hydrocarbons.
- Technology: Haldor Topsoe
- EPC Contractor: Heurtey Petrochem
- Hydrogen production capacity: 6,9 t/h (77000 Nm³/h).

Sulphur Acid Regeneratin Unit (SARU)



- Capacity: 562 kg/h (H_2SO_4).
- Resolved problem of spent acid regeneration
- Licensor: Haldor Topsoe
- EPC contractor: Kova Engineering

Delayed Coking Unit (DCU) [in progres]



Scope

New Units

- Delayed Coking Unit
- Amine regeneration unit
- Waste water treatment unit

Revamping of existing Units

- MHC/DHT
- Sulphur & Merox Unit

Effects

- Increasing of refinery profitability
- Maximizing production of high-margin final products
- Maximizing process unit utilization
- Increasing of refinery flexibility for market requirements and constraints
- Termination of HSFO production

Cost/Time

Total cost: App. 330 MM US\$

Realization (EPCm phase): 2016-2019

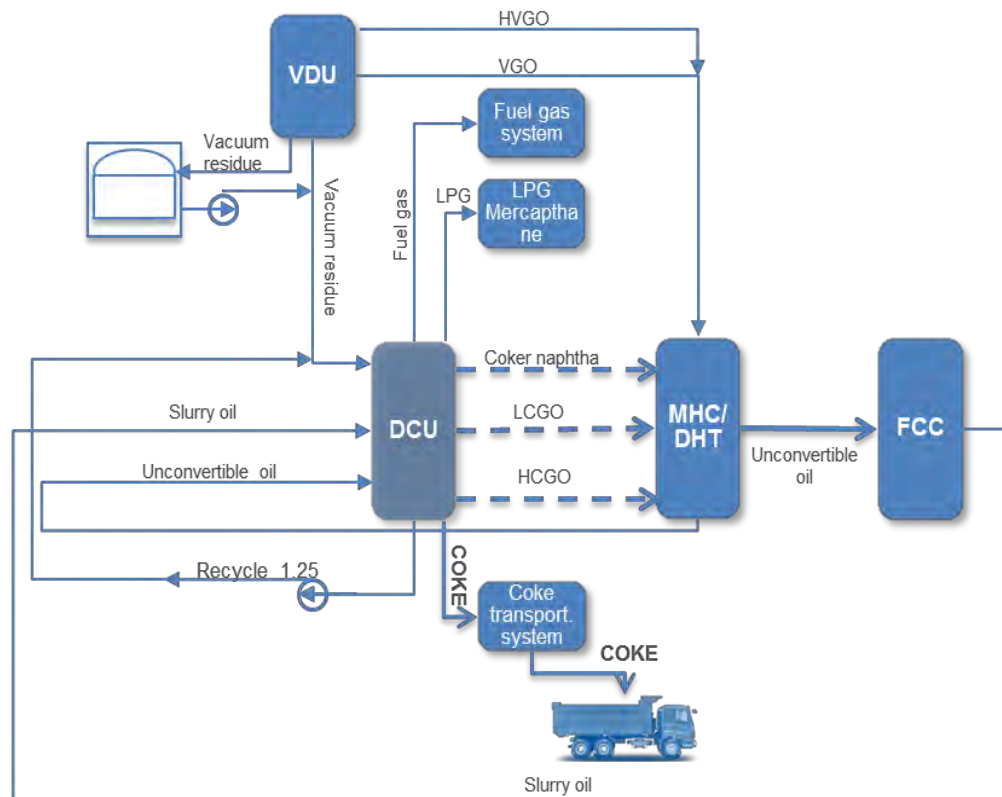
DCU Technology: Lummus Technology

EPCM contractor: CBI

Product yield:

- Increasing of JET fuel production for 11%
- Increasing of diesel production for 38%
- Increasing of motor gasoline production for 2%
- Increasing of LPG production for 7%

Delayed Coking Unit (DCU)



DCU Feed

- Vacuum Residue from Vacuum Distillation Unit
- Slurry oil from Fluid Catalytic Cracking Unit.

KEY FLOWS:

- LPG: To LPG storage (after amine washing & caustic treatment)
- Coker Naphtha and Light Coker Gasoil: to DHT;
- Heavy Coker Gasoil: to Mild Hydrocracking (MHC);
- The produced coke: market (as fuel grade coke)

DCU: Technology optimally selected for closing identified gaps

Delayed Coking Unit (DCU). Key phases



- Feasibility Study (completed 07/2013)
- FEED CONTRACTOR Selection (completed 02/2015)
- BASIC/FEED Design (completed 02/2016)
- EPCM CONTRACTOR Selection (completed 10/2016)
- EPCM (expected duration is 28 months)

Thank you