IPD

Green Chemistry

Process & Technology Solutions

IPD-Green Chemistry

- Green Glycols from Sugars
- Green Glycols from Biodiesel Glycerin
- Biofuels
- Process Engineering
- Catalyst Development
- Technology Development Platform
- Environmental & Recycling Issues

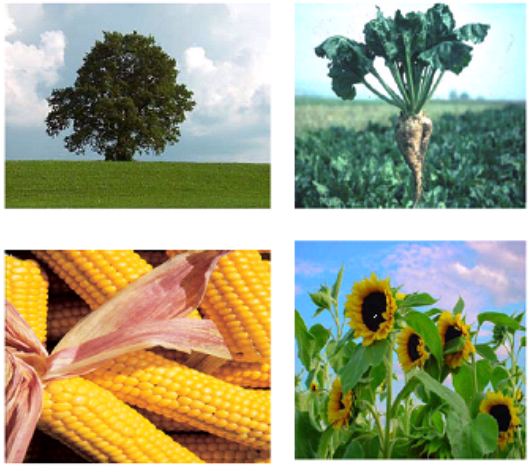
IPD-Green Chemistry

Operation of a Hydrogenation Recearch & Catalyst Test Center located in Iceland

Focus on Renewable Raw Materials, Green Chemicals and Sustainable Processes

Biorenewables

- Lignin
- Cellulose
- Chitin
- Hemicelluloses
- Sugar
- Starch
- Oil/Fats



Biobased products

Market potential and applications

- Polymers
- Surfactants
- Solvents
- Dyes
- Aromas
- Pharmaceuticals
- Cosmetics
- Fuels
- Lubricants
- Fibres

Operation of a Hydrogenation Recearch & Catalyst Development Center located in Iceland Focus on Renewable Fuels/Chemicals and Sustainable Processes

Icelandic Process Development Ltd.

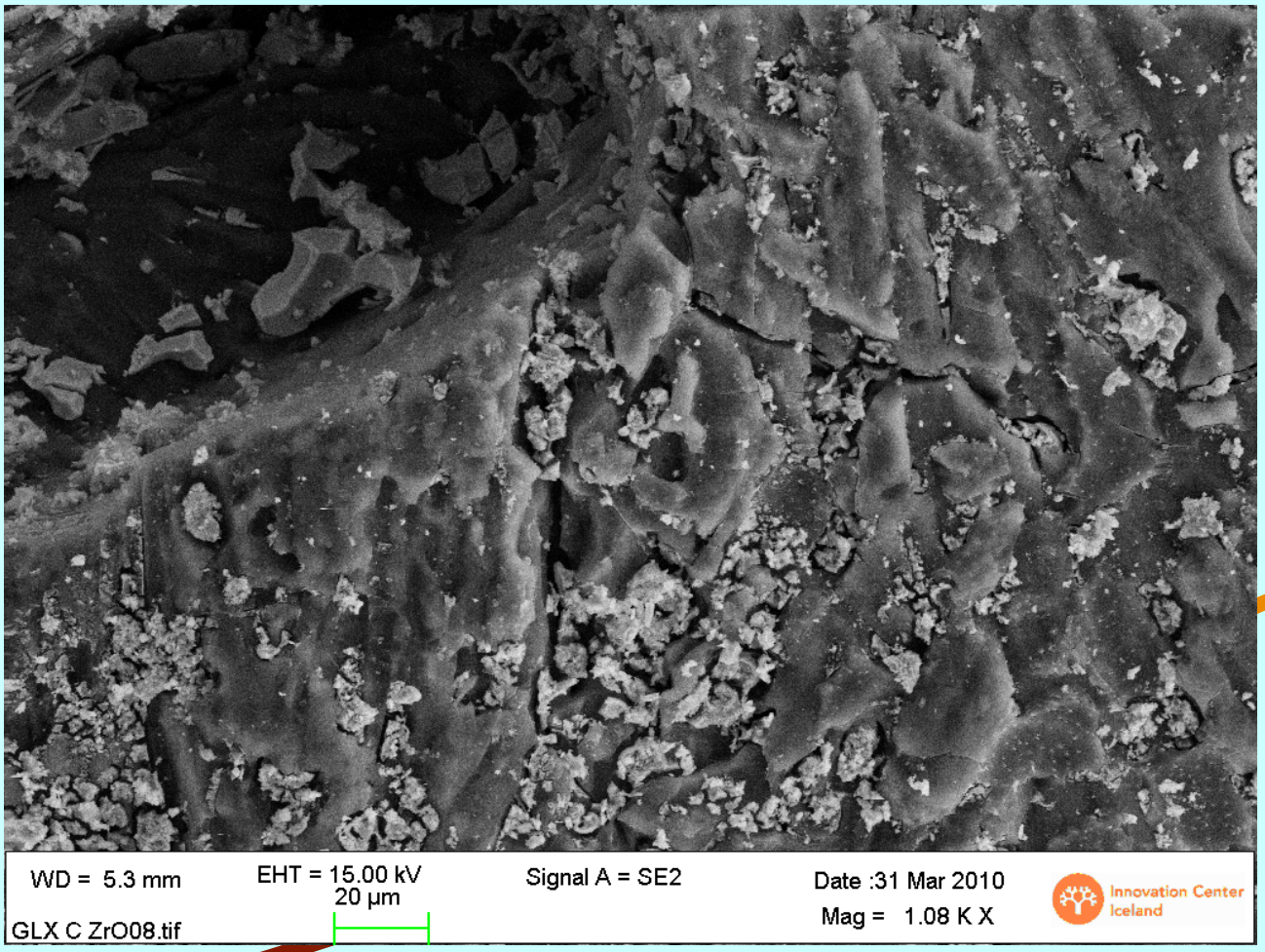
Background in Chemical Plant Operation

- Large sized high pressure testing systems
- Pilot Plant Programs

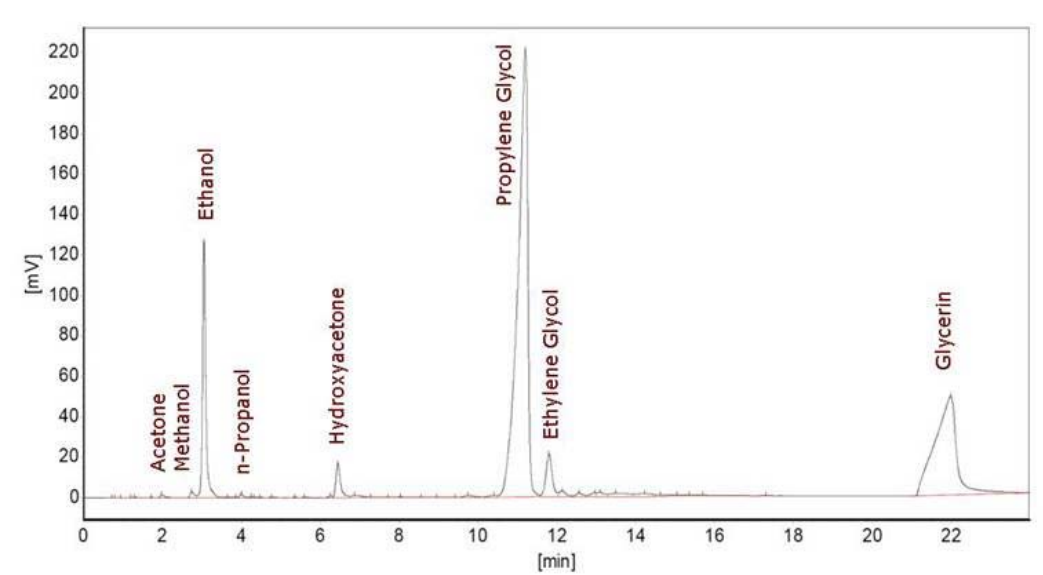
Process Realization

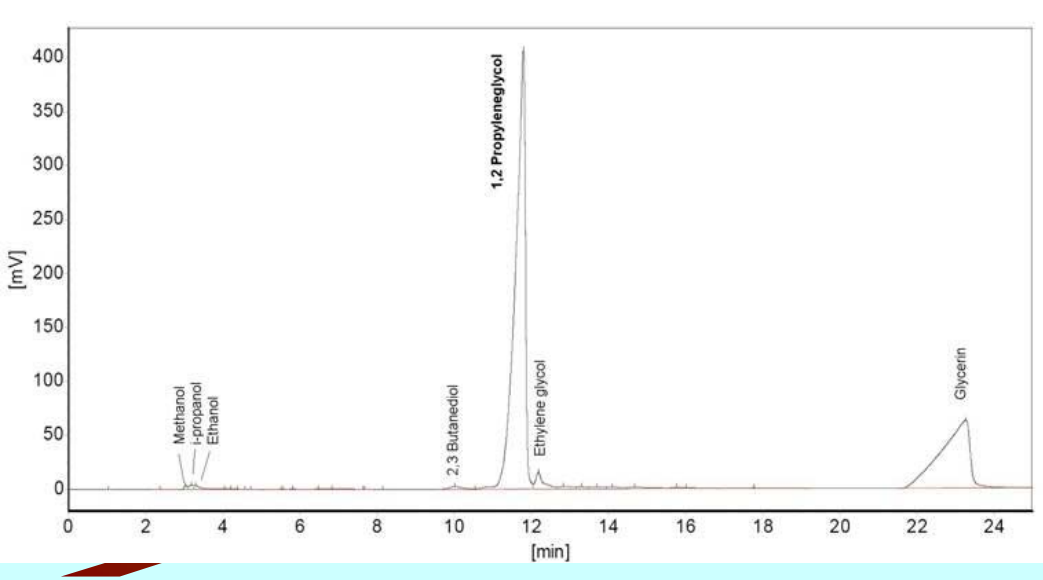
- Process Design
- Industrial Projects

CATALYST DESIGN

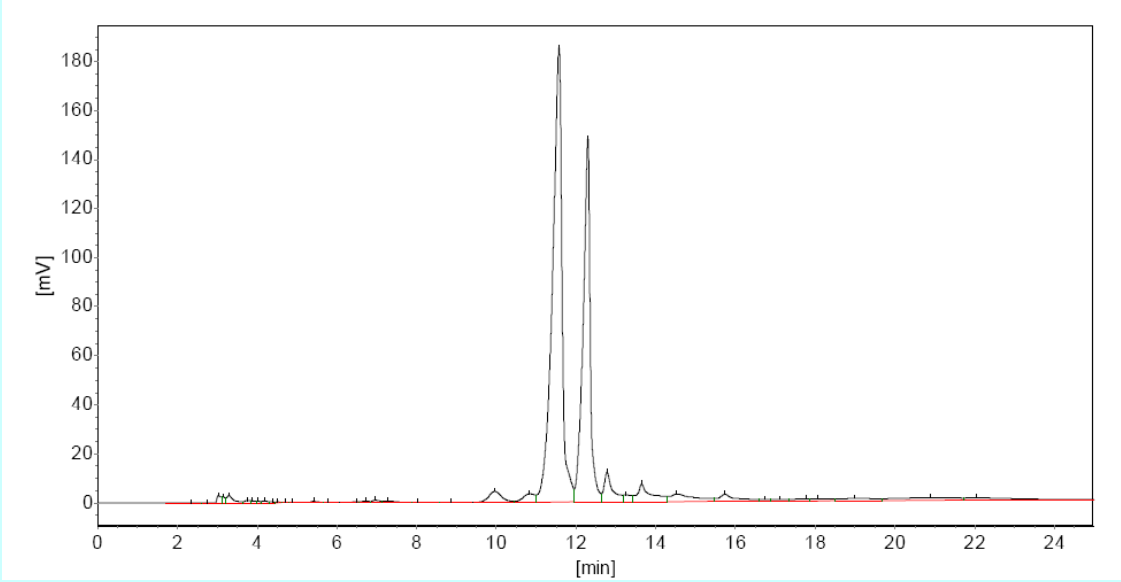


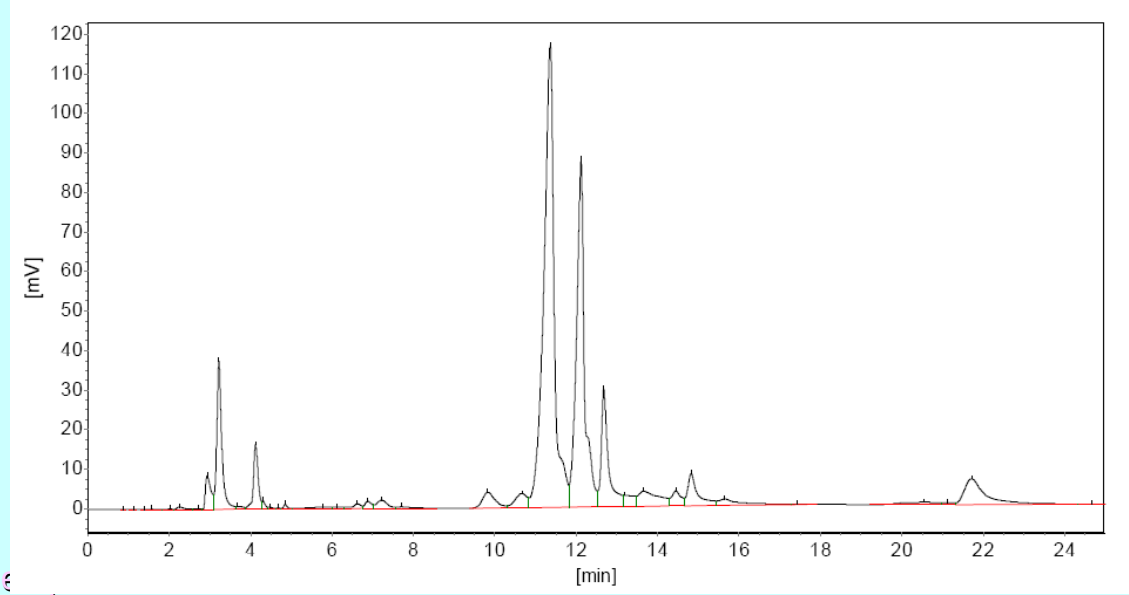
Gas chromatographic product slate
C-3 cracking

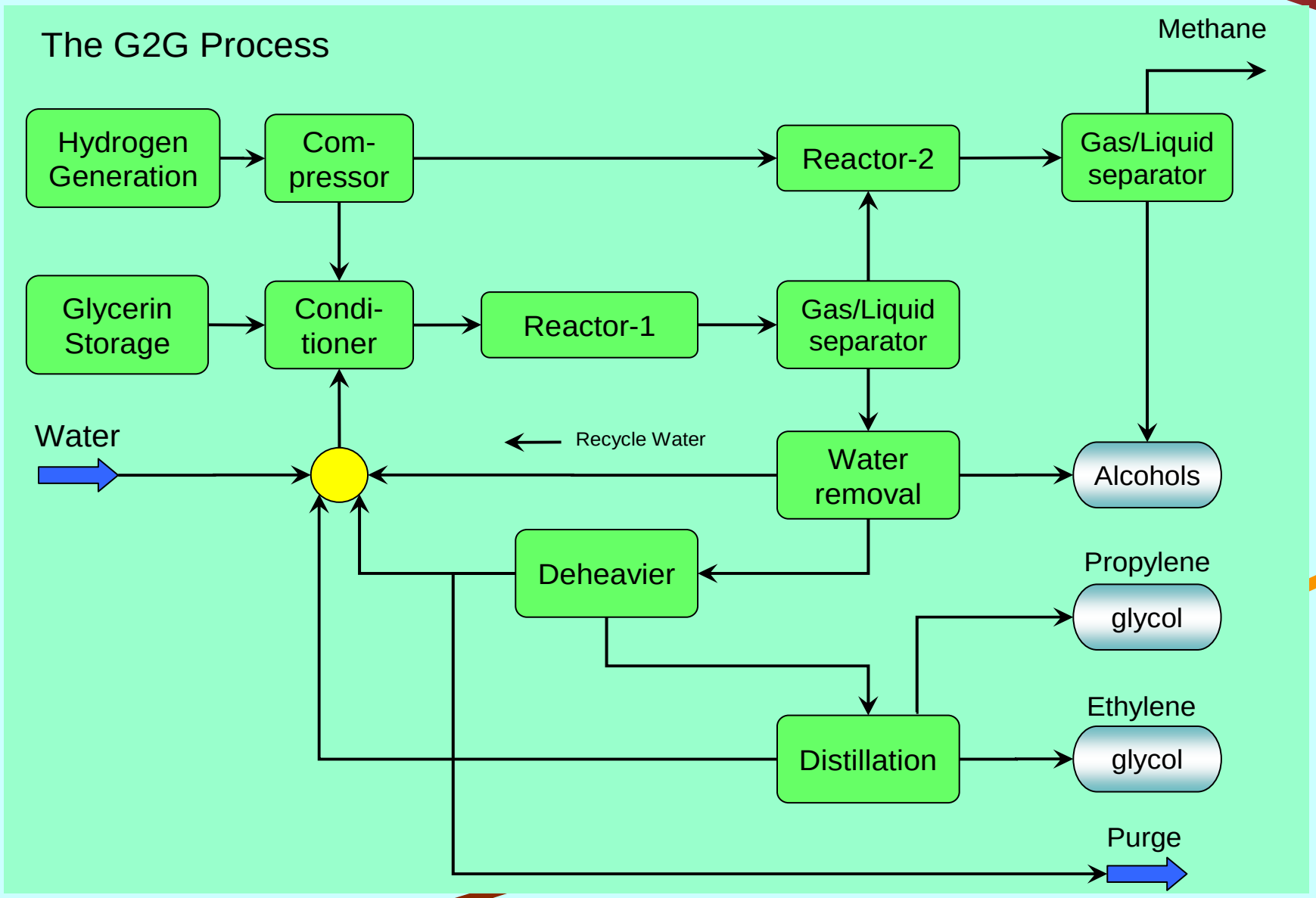




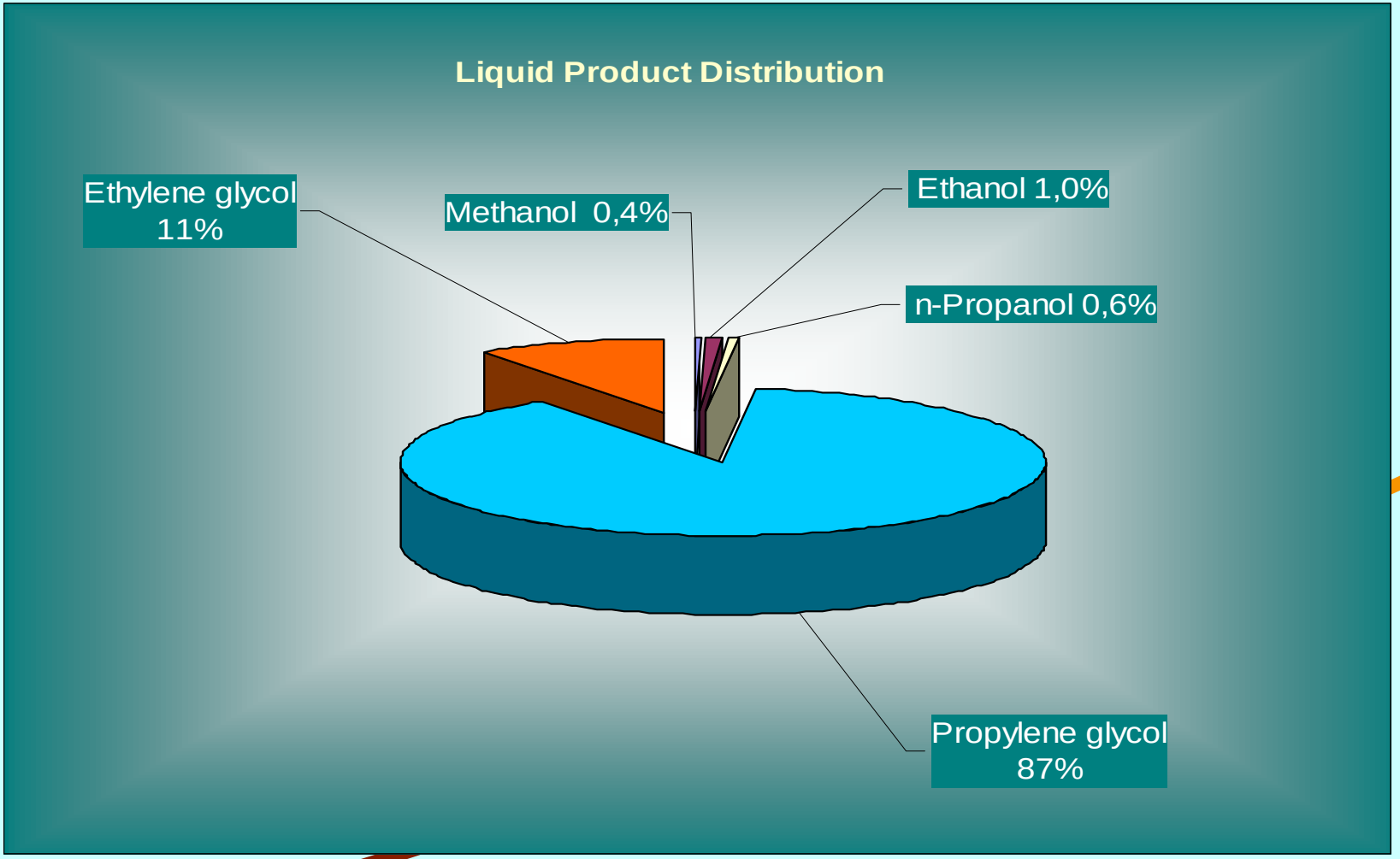
Gas chromatographic product slate
C-5 cracking



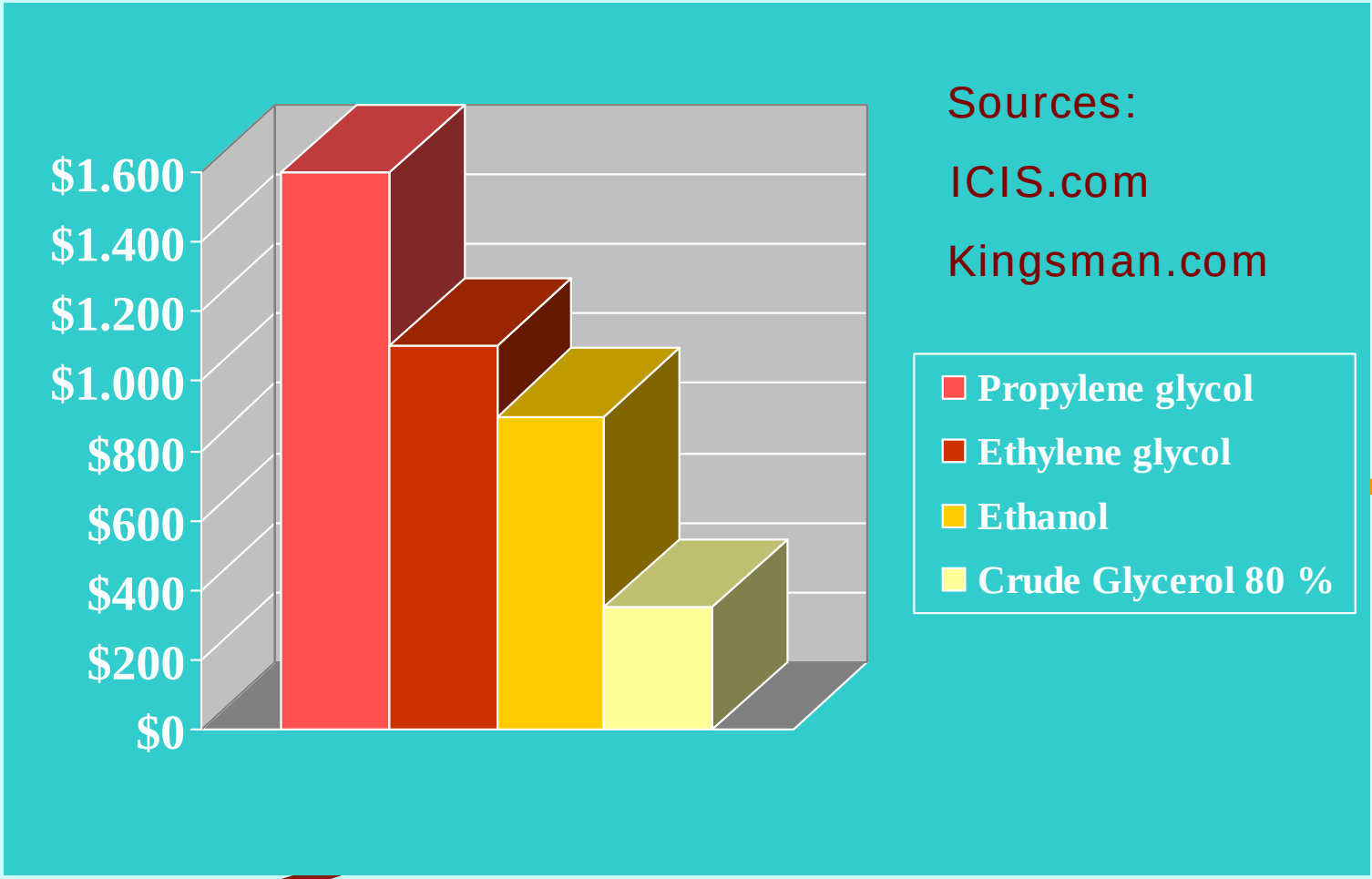



The G2G Process
Methane
Hydrogen Generation
Com-pressor
Reactor-2
Gas/Liquid separator
Glycerin Storage
Condi-tioner
Reactor-1
Gas/Liquid separator
Water
Recycle Water
Water removal
Alcohols
Deheavier
Propylene
glycol
Ethylene
glycol
Distillation
Purge

Product Distribution



Common market prices per metric tonne January 2011



EG

- ***Ethyleneglycol*** is used as a base compound in polyester formulations such as PET–bottles and textile products. Furthermore ethyleneglycol is the common automotive radiator coolant liquid - (antifreeze).

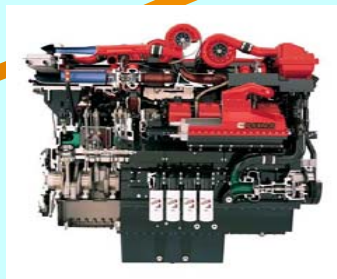
PG

- ***Propyleneglycol*** is used as a base compound in polyglycol ethers and in polyurethane- and polyester-resin formulations. Also as surface active ingredient in cosmetic, pharmaceutical and hygenic products.

Bio-fuels

- ***Alcohol-Oxochemical-mix*** can be used as a octane booster blend for biofuel mixtures. Ethanol possibly to be isolated for different higher value applications.



Preferred Site Conditions

- ***Close by Raw Material Availibility***
- ***Inland Market Potential for Products***
- ***Steam and Hydrogen over fence***
- ***Technical & Operational Partner***
- ***Financial Partner***
- ***Local Network of Engineering and Workshop Contractors***

-Industrialization of IPD's Technology

<Project Vision>

- ***Phase I*** ***30.000 tpa*** ***27 kton of PG***
- ***Phase II*** ***60.000 tpa*** ***54 kton of PG***
- ***Phase III*** ***120.000 tpa*** ***108 kton of PG***

Basic Utility Reqirements for 30.000 tpa Glycol Plant

- Electrical power 2,0 MW
- Steam(Thermal power) 15-20 ton/h
- Hydrogen 1000-1500 Nm^3/h

Icelandic Power Sources

Geothermal Well 10-50 MW_{th}

Power Generation 120 MW_{el} 400 MW_{th}

Nesjavellir

Local environment – Preferred:

- Short distances to raw material sources
- Offgas low cost hydrogen supply sites possibilities?
- Markets – close by
- Access to natural gas grid

Why a cooperation with IPD?

- First comes, first gets!
- IPD has special know how in geothermal, energy and chemical processing environment.
- IPD provides unique opportunites for the establishment of sustainable chemical production out of regenerative feedstocks
- Glycerin to Biofuels and Glycols is highly economically feasible