



3DO.6.1

Catalytic hydroprocessing of ground cottonseeds in a cottonseed oil and i-octane solvent to produce renewable diesel

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It all starts here



Background and motivation

3DO.6.1



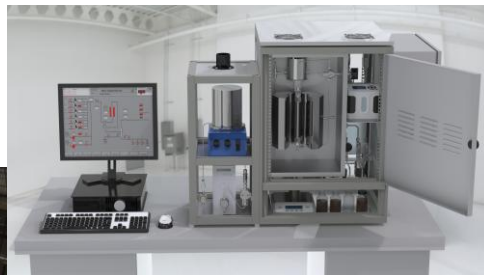
Background and motivation



- Hydrotreatment of HTL bio-oil (two-step process)

Background and motivation

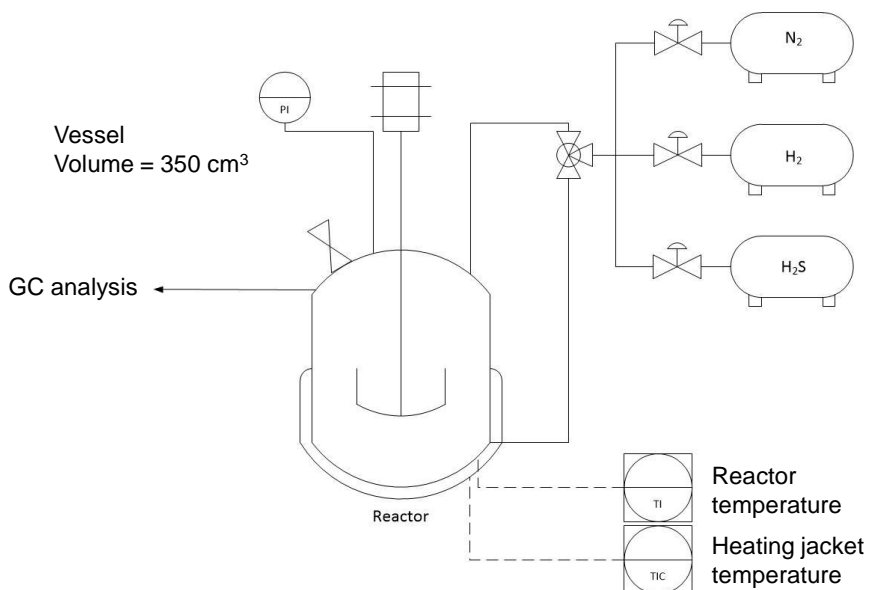
- Aim
 - Determine if renewable diesel can be directly produced from dry biomass
 - Maximize renewable diesel yield
- Objectives
 - Biomass loading
 - Effect of solvent
 - Effect of temperature



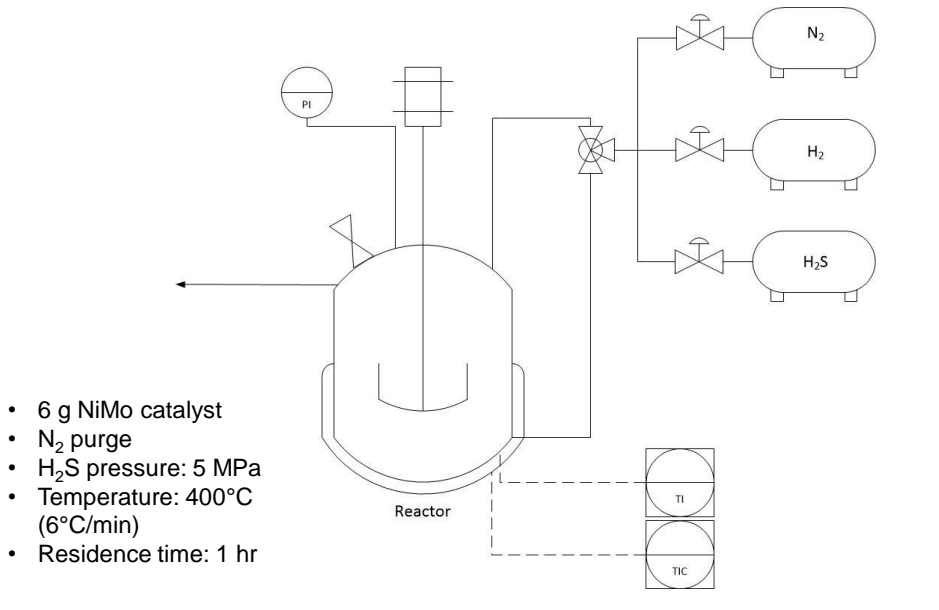
Experimental setup



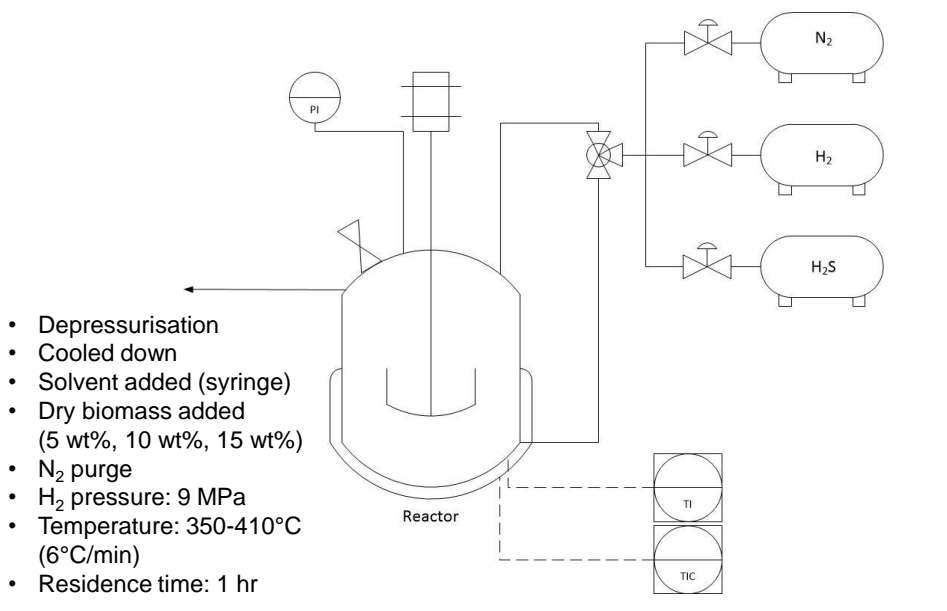
Experimental setup



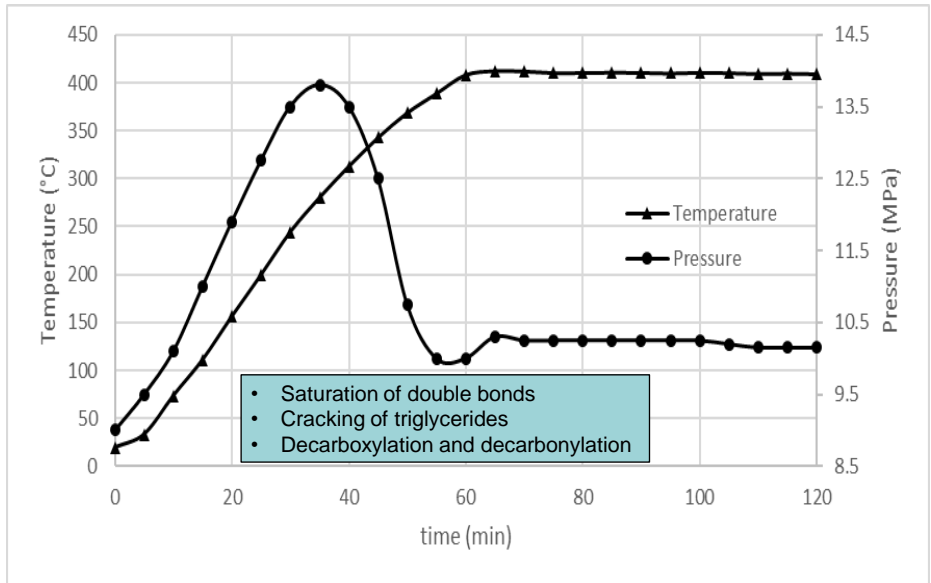
Catalyst activation



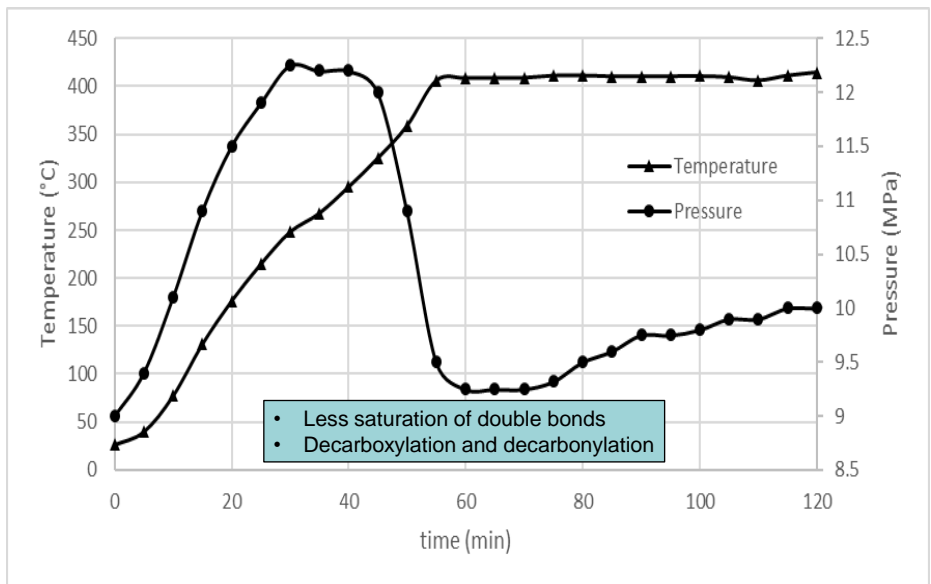
Reaction



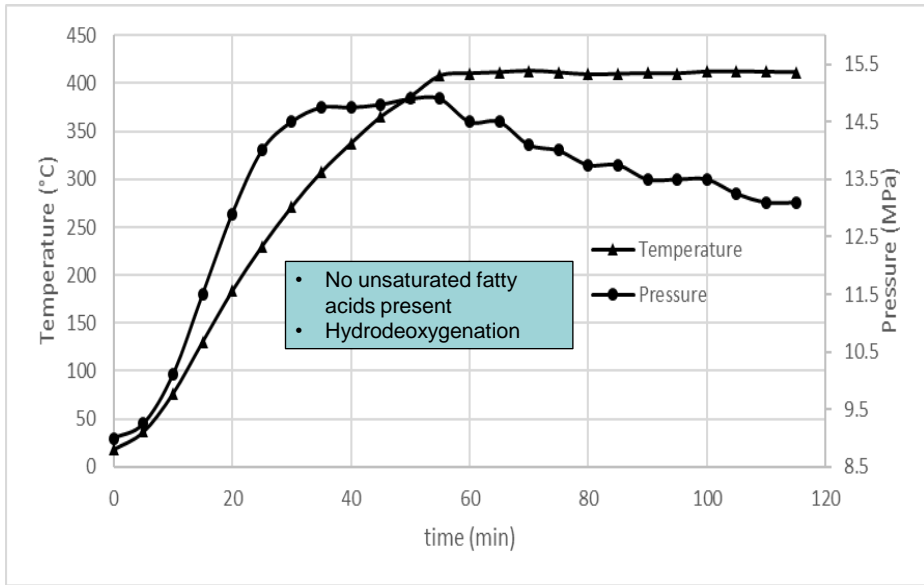
Pure cottonseed oil (9 MPa, 410°C)



Cottonseed oil as solvent (9 MPa, 410°C)

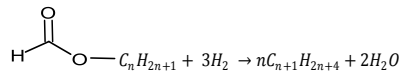
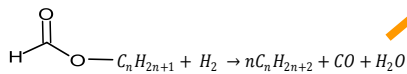
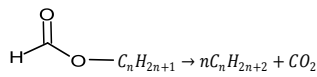


Iso-octane as solvent (9 MPa, 410°C)



Reaction pathway

- Reaction pathways
 - Decarboxylation
 - Decarbonylation
 - Hydrodeoxygenation



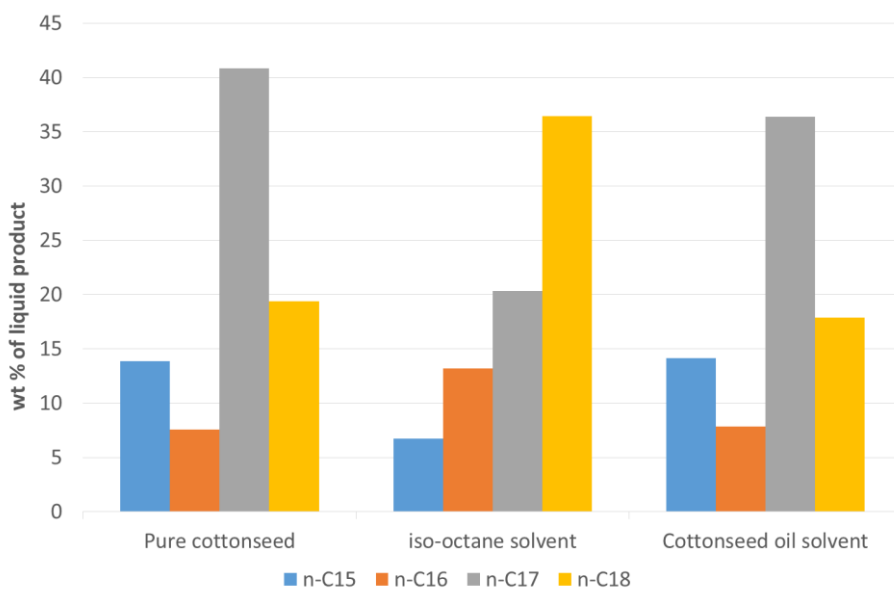
$$\frac{C_{n+1}}{C_n} < 1$$

$$\frac{C_{n+1}}{C_n} > 1$$

Reaction pathway

Temperature (°C)	Solvent	C ₁₈ :C ₁₇	C ₁₆ :C ₁₅
350	Cottonseed oil	0.86	0.98
390		0.70	1.04
410		0.49	0.56
350	Iso-octane	1.73	1.86
370		1.71	1.79
390		1.75	1.83
410		1.79	1.95

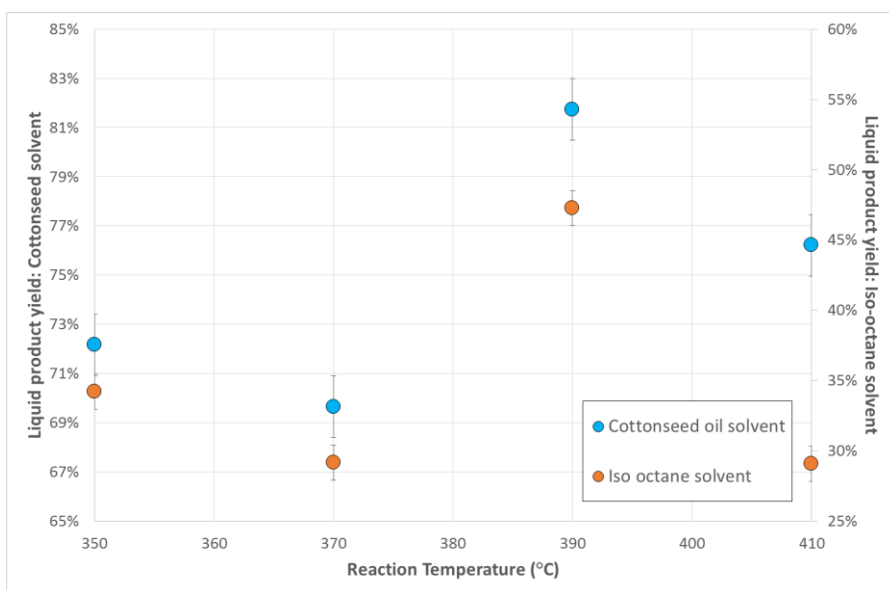
Reaction pathway



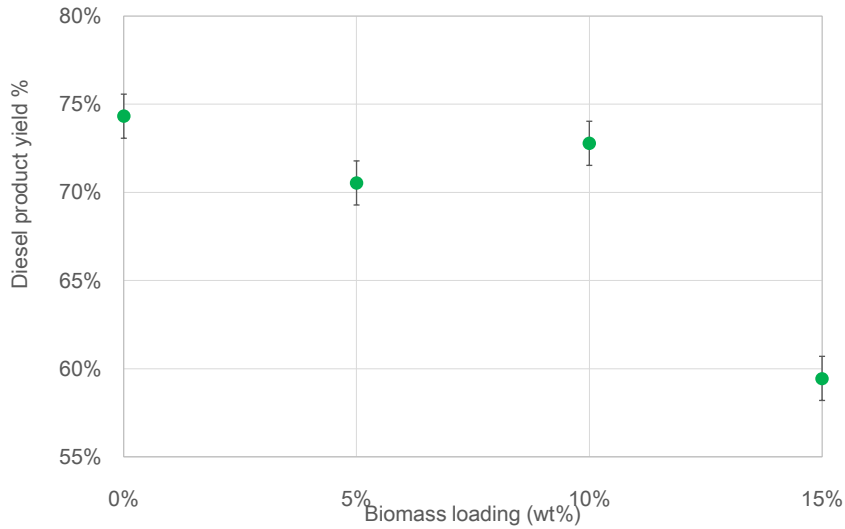
Liquid and char yields

Temperature (°C)	Cotton seed oil solvent		i-octane solvent	
	Liquid yield	Solid yield	Liquid yield	Solid yield
350	72%	9%	34%	19%
370	70%	7%	29%	20%
390	82%	2%	47%	7%
410	76%	1%	29%	11%

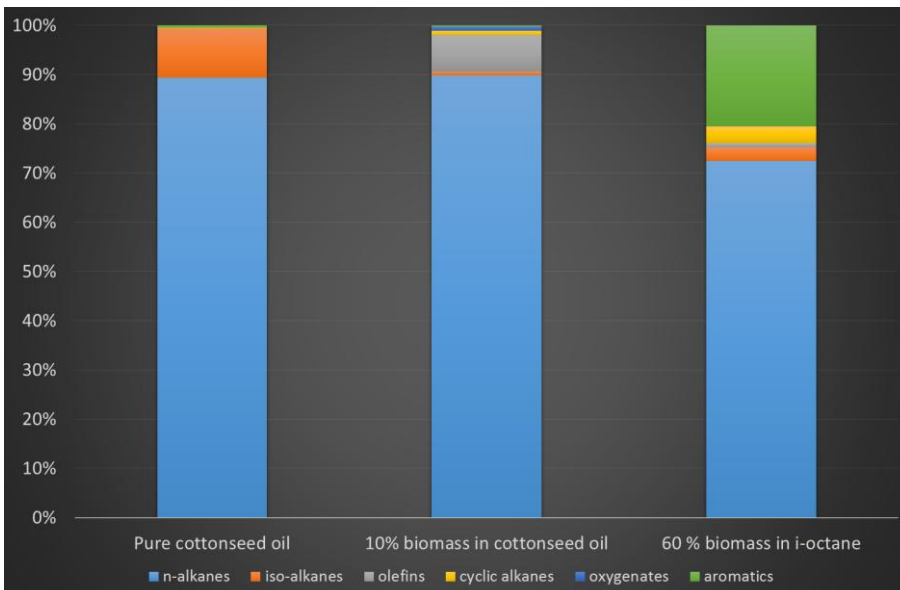
Liquid yield



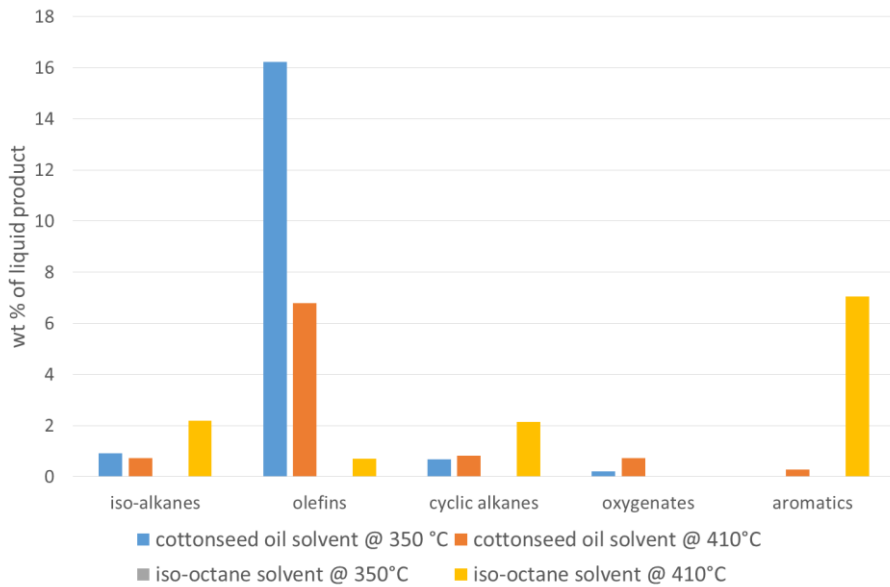
Biomass loading: Cottonseed oil



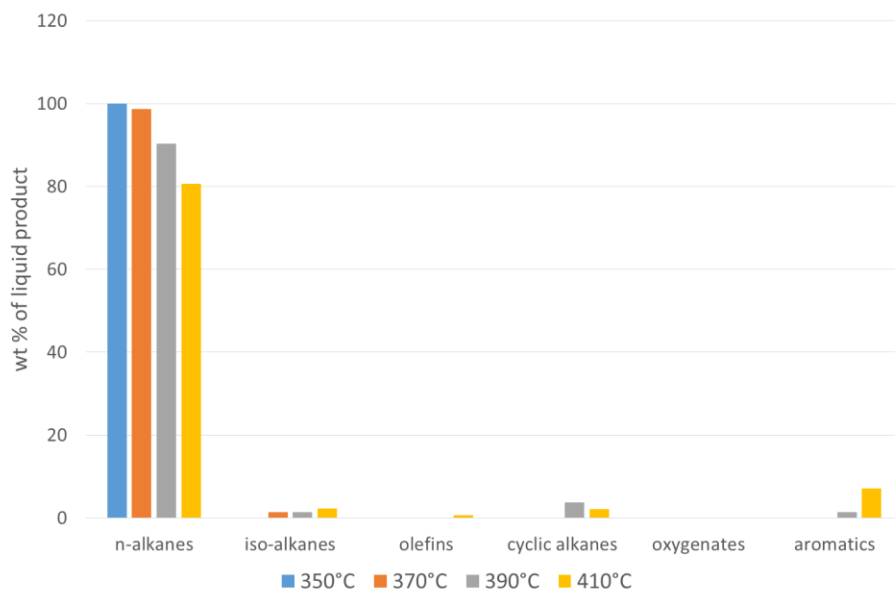
Liquid composition (9 MPa, 410°C)



Results and discussion



Results and discussion: iso-octane



Conclusion

- Liquid phase is indeed renewable diesel
- Possible to produce renewable diesel from dry biomass
- Maximum liquid yield at 390°C, 10 wt%



Thank you

Tack så mycket

It all starts here

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