



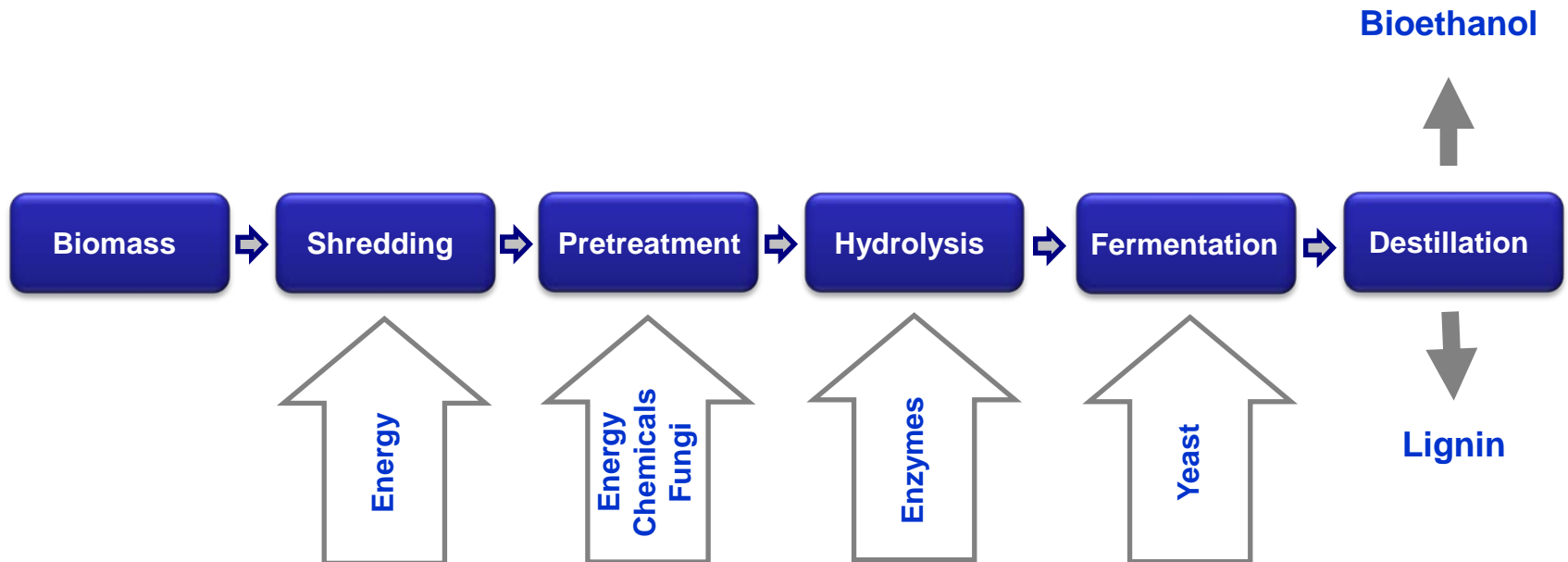
University of Applied Sciences

The current situation of lignocellulosic bioethanol – with regard to straw in Austria

Heike Kahr, Alexander JÄGER



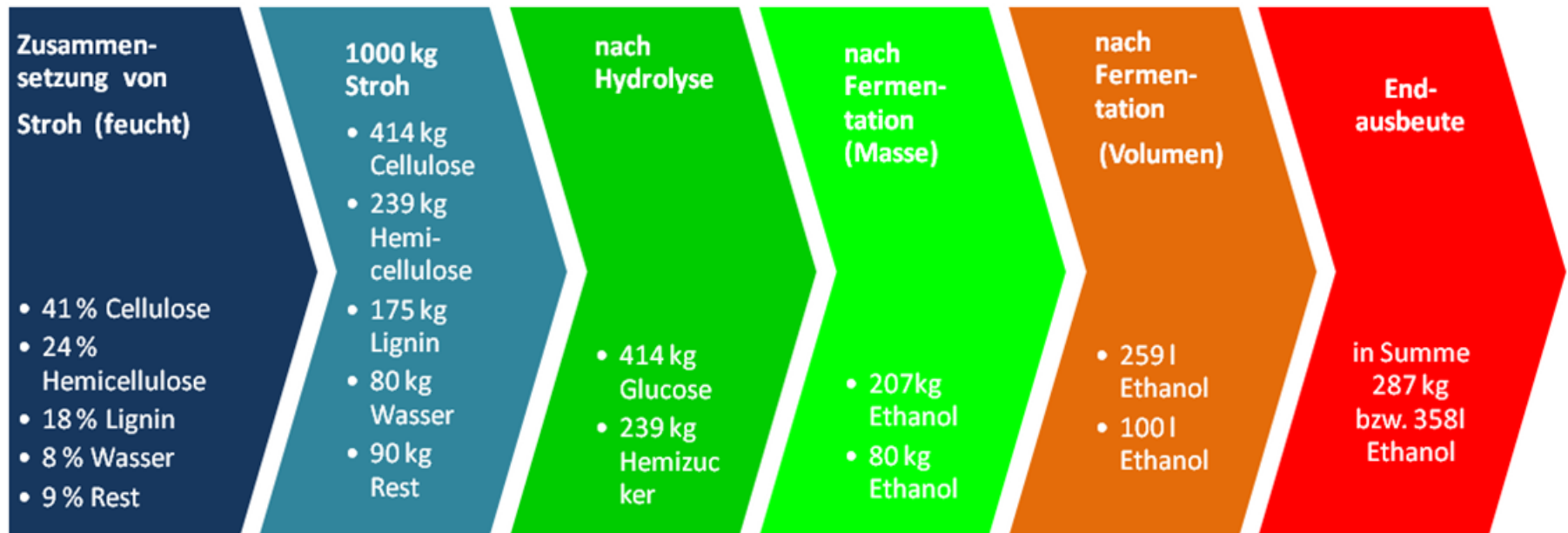
Bioethanol Process „basic“





Mass balance

Bioethanol Process „basic“



**1000 kg Stroh /
10 m³ H₂O**

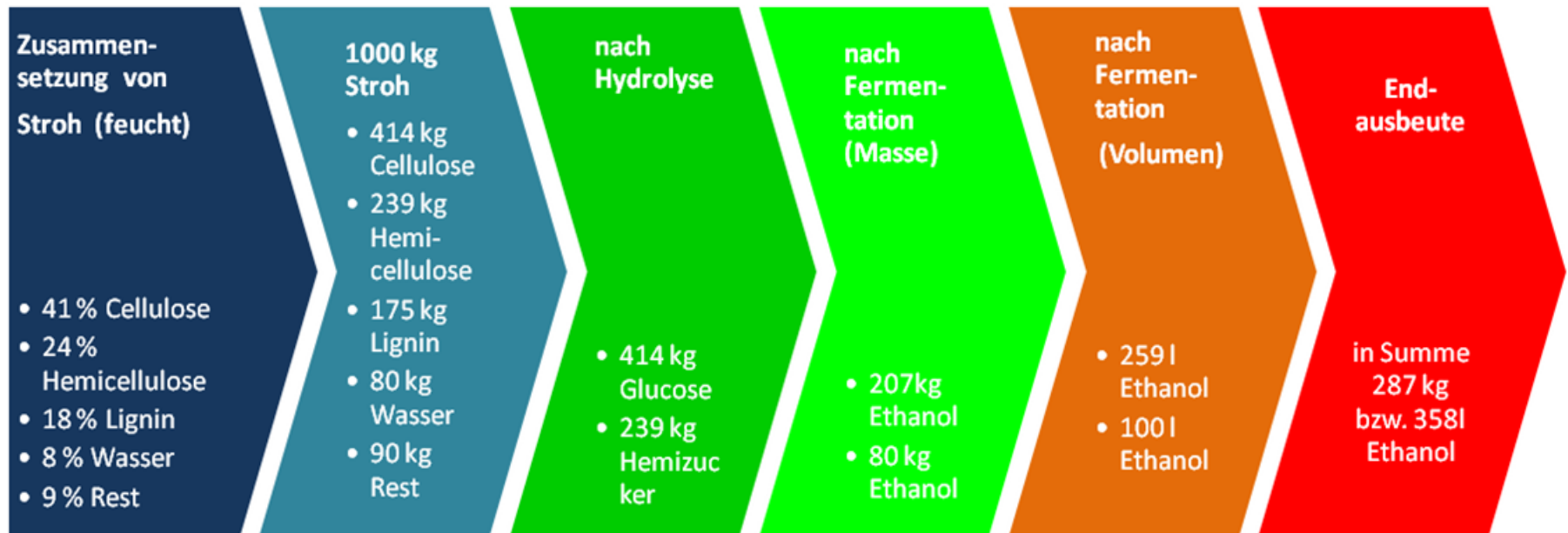


**287 kg Ethanol
3,58 % Vol**



Mass balance

Bioethanol Process „basic“



1000 kg Stroh /
10 m³ H₂O

Cellulose



207 kg Ethanol
2,58 % Vol



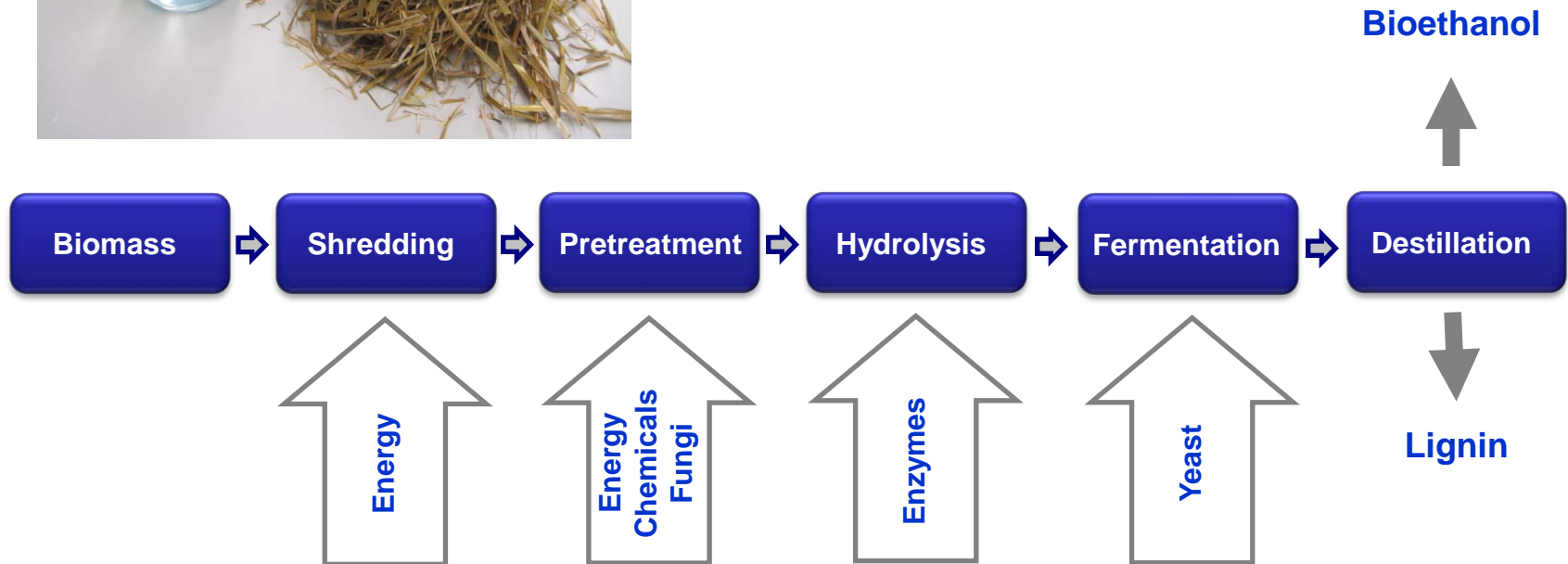
Bioethanol Process „basic“



10 % Straw

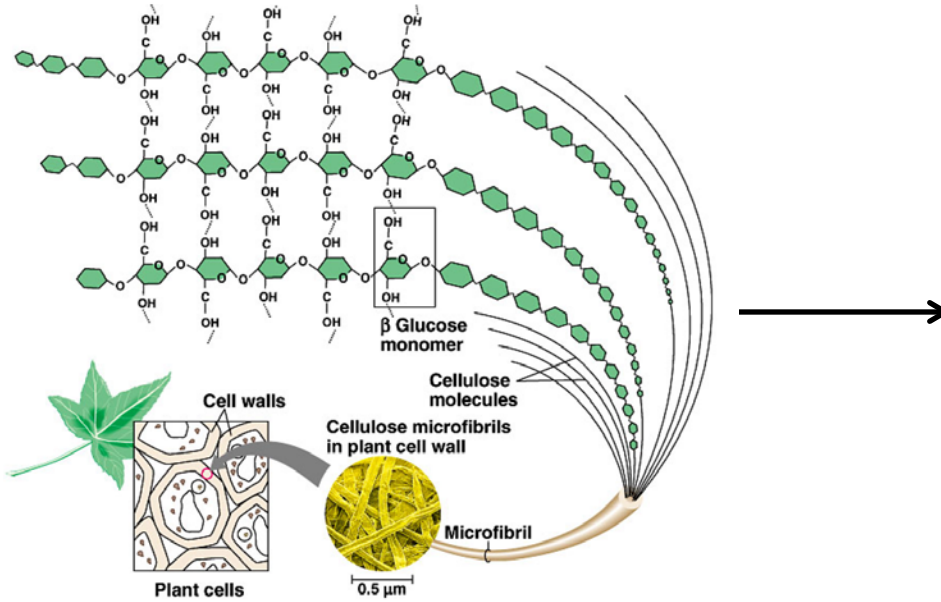


207 kg Ethanol/t
2,6 % Vol. Ethanol





„Basic Process“ Wels



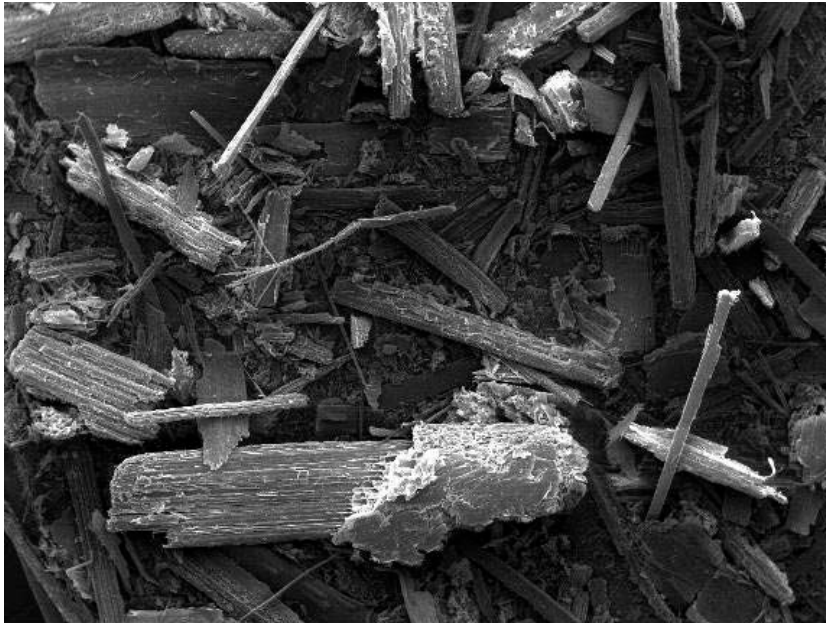


„Basic Process“ Wels





„Basic Process“ Wels



SEM MAG: 60 x
SEM HV: 20.00 kV
Vac: HiVac
Det: SE Detector
Date(m/d/y): 03/20/08
Device: VEGA II LMU
2 mm
VEGA\\ TESCAN
fh ooe

Straw untreated

Yield 95 %



200 kg Ethanol/t
2,5 % Vol. Ethanol



SEM MAG: 60 x
SEM HV: 20.00 kV
Vac: HiVac
Det: SE Detector
Date(m/d/y): 03/20/08
Device: VEGA II LMU
2 mm
VEGA\\ TESCAN
fh ooe

Straw treated



Advanced Bioethanol Process



20 % Straw



414 kg Ethanol / t
5,2 % Vol. Ethanol



Advanced Bioethanol Process



30 % Straw



621 kg Ethanol / t
7,8 % Vol. Ethanol



Advanced Bioethanol Process



40 % Straw



828 kg Ethanol / t
10,2 % Vol. Ethanol

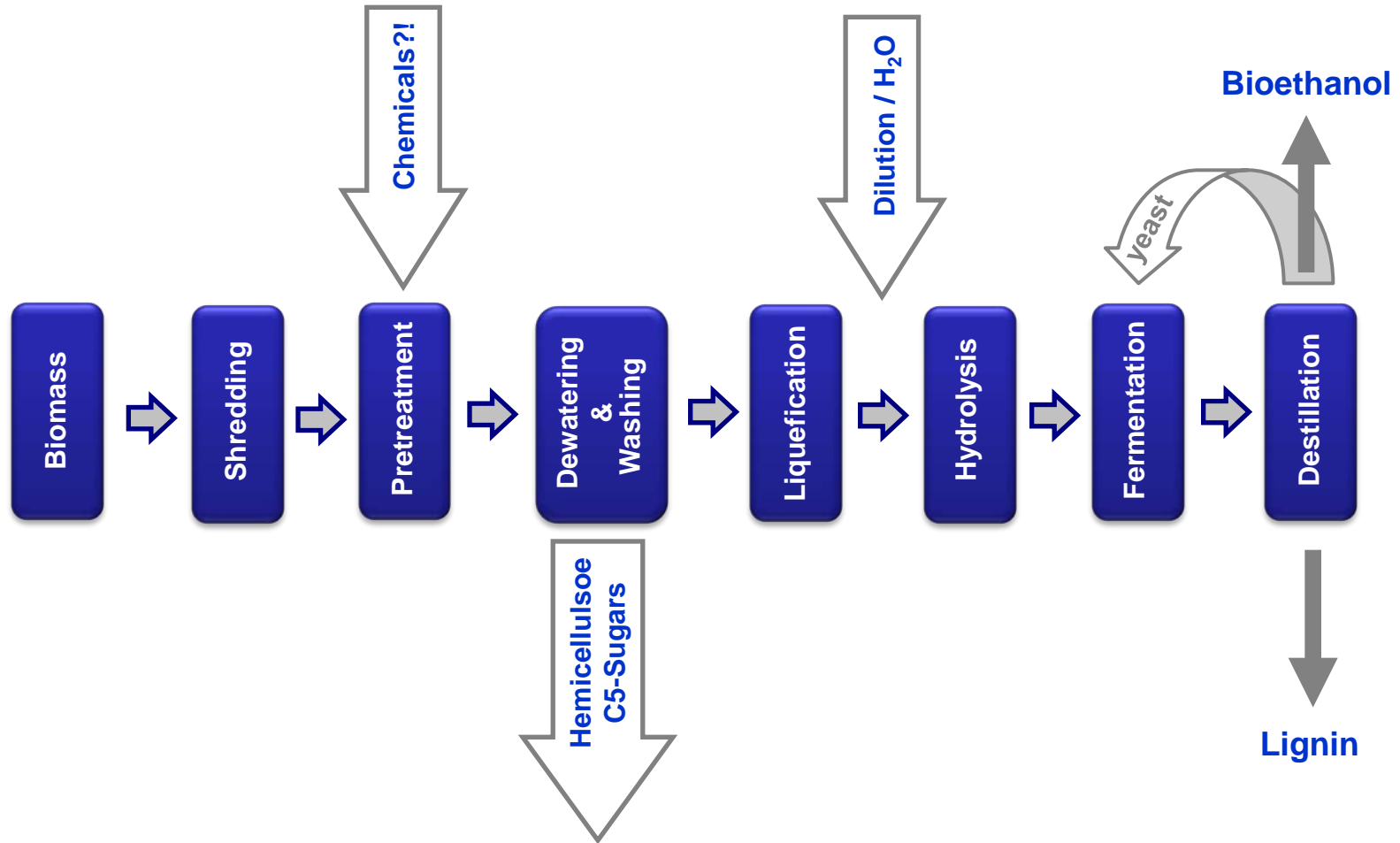


How to dissolve 40 % straw?



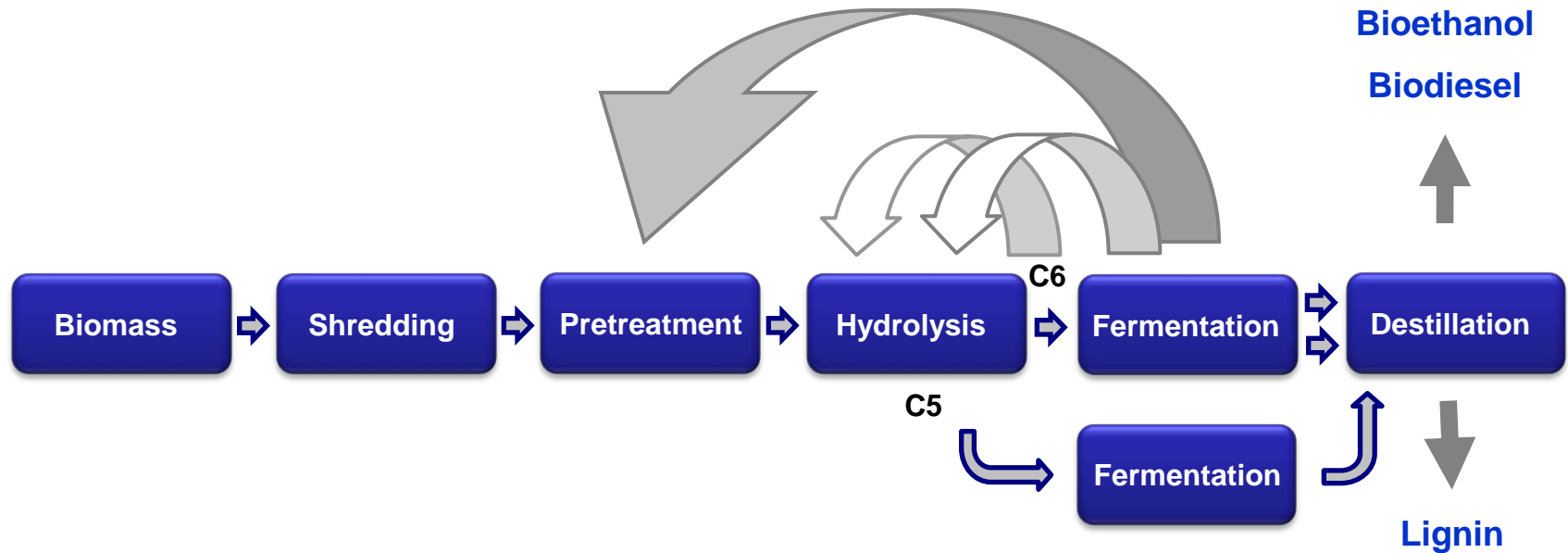
Advanced Bioethanol Process

Inbicon Process



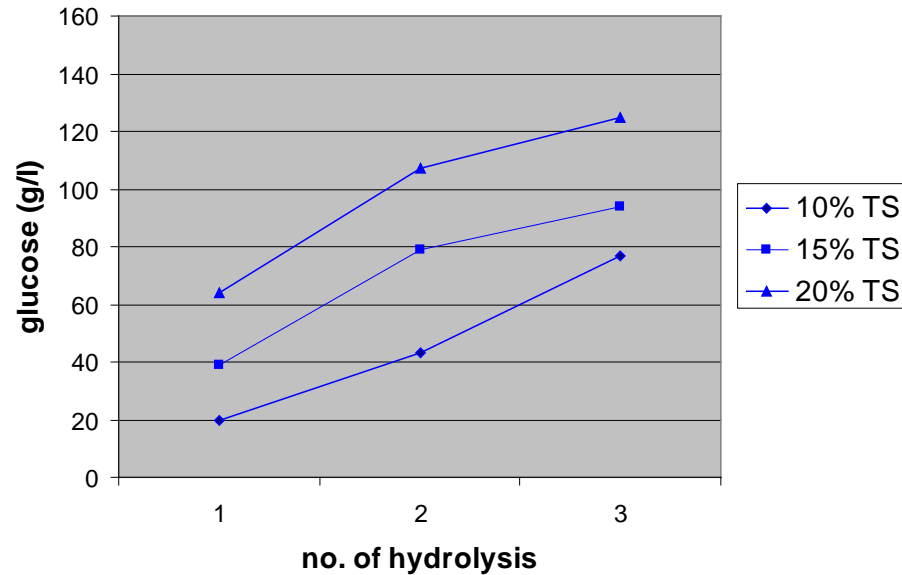


Advanced Bioethanol Process „Wels Process“

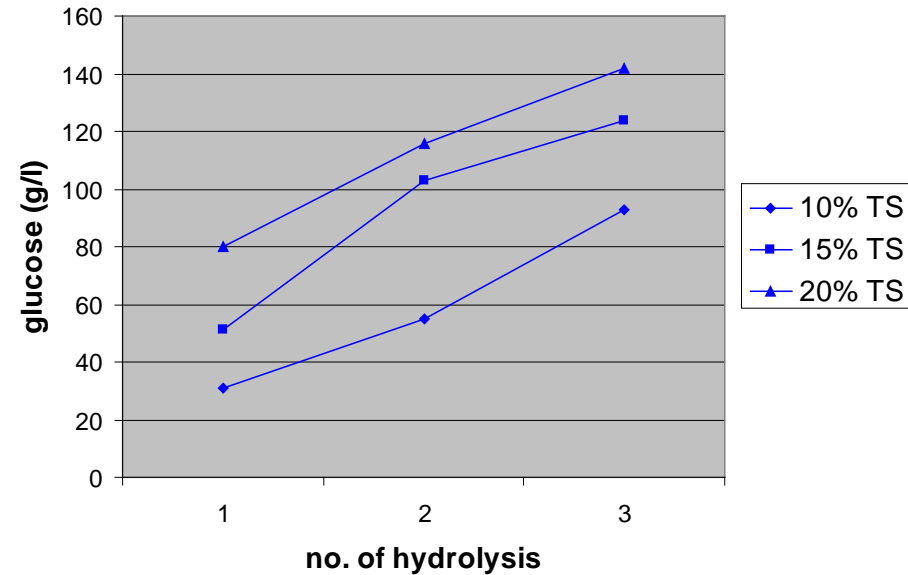




Results „Wels process“



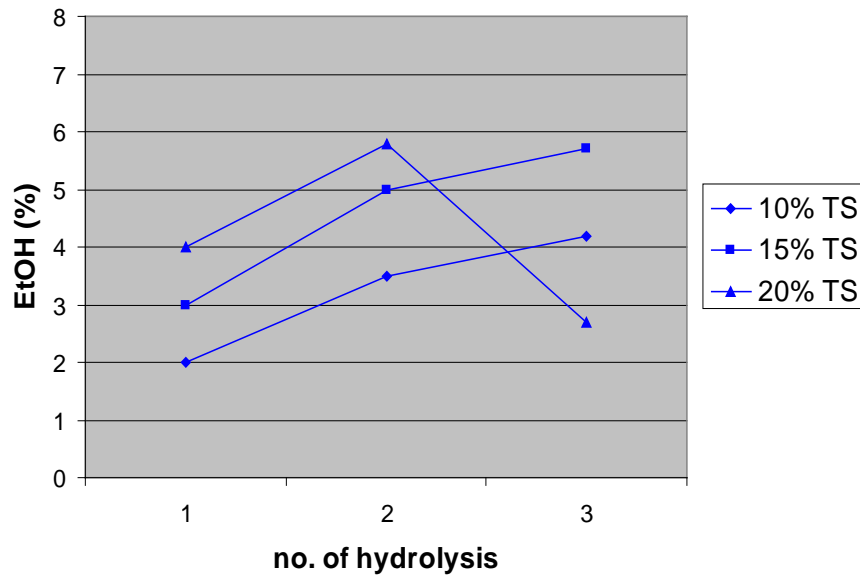
Standard assay



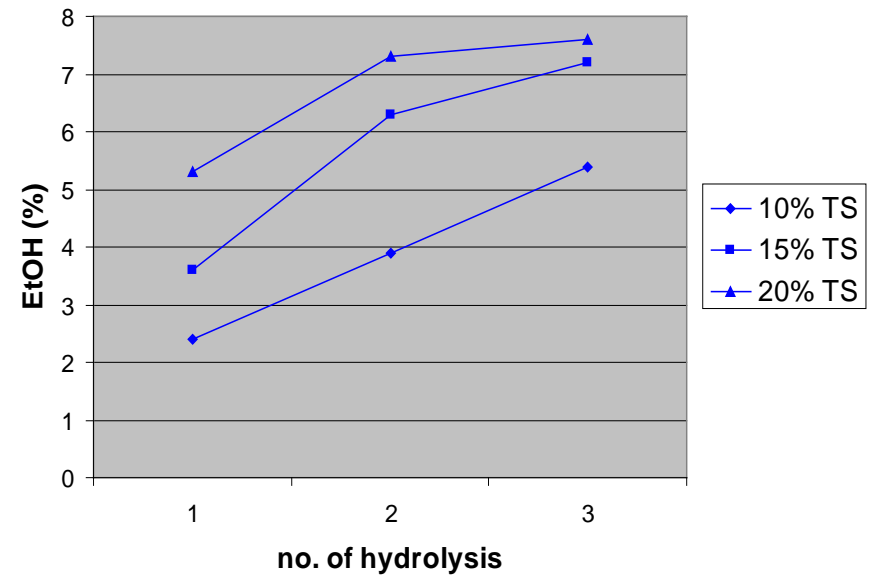
Inhibitor control



Results „Wels process“



Standard assay



Inhibitor control



Bioethanol Potential Austria

Residual Materials incl. Wood

	Straw	Recycled paper	Wood unused	Total
Quantity tons pa available	2.000.000	800.000	6.000.000	
Usage rate	50%	50%	25%	
Tons pa	1.000.000	400.000	1.500.000	
Cellulose content	41%	80%	40%	
Hemicellulose content	24%	2%	20%	
Yield C6	95%	90%	20%	
Yield C5	50%	50%	20%	
l Bioethanol / ton	321	183	113	
m3 Bioethanol pa	320.563	182.500	112.500	615.563
Total Mileage(6 l/100 km)	5.342.708.333	3.041.666.667	1.875.000.000	10.259.375.000
Average mileage Km	15.000	15.000	15.000	
No of cars	356.181	202.778	125.000	683.958
No of cars Austria				4.200.000
Rate of Substitution	8%	5%	3%	16%



Scenario: Complete replacement of fuel by means of Bioethanol in Austria

Agricultural area		1.375.822
Usage rate bioethanol production	33%	454.021
Extensive greenland / wasteland	ha	900.980
Usage rate	33%	297.323
Intensive grassland	ha	909.407
Usage rate	33%	300.104
Total	ha	1.051.449
Ethanol Yield Crops	m ³ /ha	4,65
Ethanol Yield Crops	m ³ p.a.	4.889.238
Ethanol Yield Straw	m ³ /ha	2,66
Ethanol Yield Straw	m ³ p.a.	2.796.854
Total	m ³ p.a.	7.686.092
Rate of substitution	%	100



Scenario: Complete replacement of fuel by means of Bioethanol in Europe

Agricultural area		180 Mio ha
Aera demand:		
Replacement by 1st generation EtOH	100 %	- 60 Mio ha
Replacement by 1st and 2nd generation EtOH	100%	- 40 Mio ha
Replacement by 1st and 2nd generation EtOH incl. C6 and C5 sugars	100 %	- 30 Mio ha
Increase productivity agriculture, use of intermediate crops	10 %	+ 18 Mio ha
Replacement of soy beans etc.	10 %	> 20 Mio ha
Saldo		+

No additional demand in agricultural area!



Research on bioethanol 2 G must be interdisciplinary

Thanks to our research group



Thanks for your attention

A.Jaeger@fh-wels.at ; H.Kahr@FH-wels.at