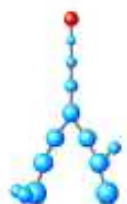


DSTF Technology Platform toward process intensification and circular economy

GIANCARLO CRAVOTTO

Full Professor of Organic Chemistry
Department of Drug Science and Technology
University of Turin
Department Director

European Society of Sonochemistry (ESS)
President



DSTF
DIPARTIMENTO DI SCIENZA E
TECNOLOGIA DEL FARMACO
UNIVERSITÀ DEGLI STUDI DI TORINO





Dipartimento di Scienza e Tecnologia del Farmaco

Dipartimento di Scienza e Tecnologia del Farmaco



UNIVERSITÀ
DEGLI STUDI
DI TORINO



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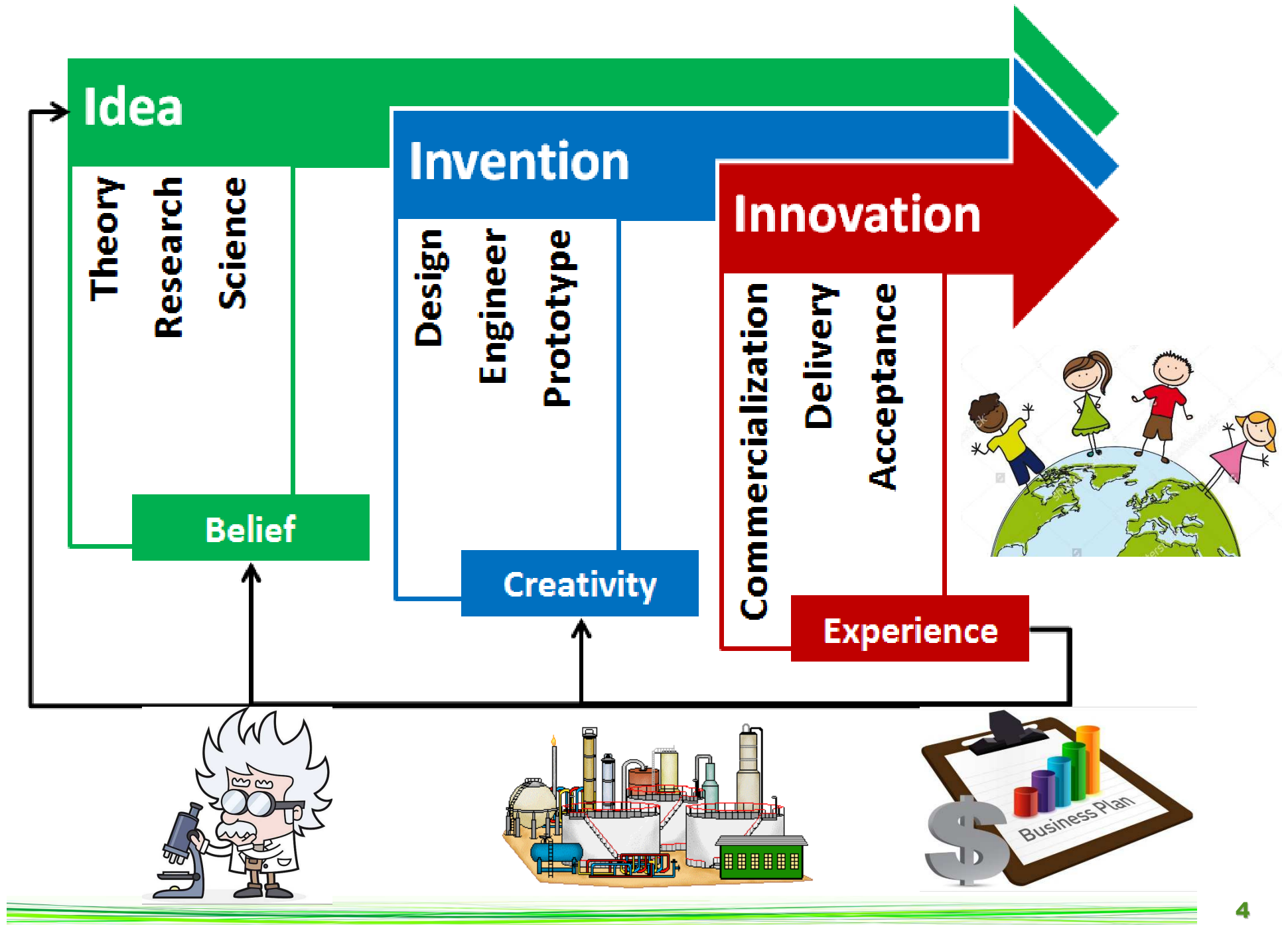


Open access Labs and Services



BIOMASS VALORIZATION IN PIEDMONT FROM AGRO-FOOD INDUSTRY

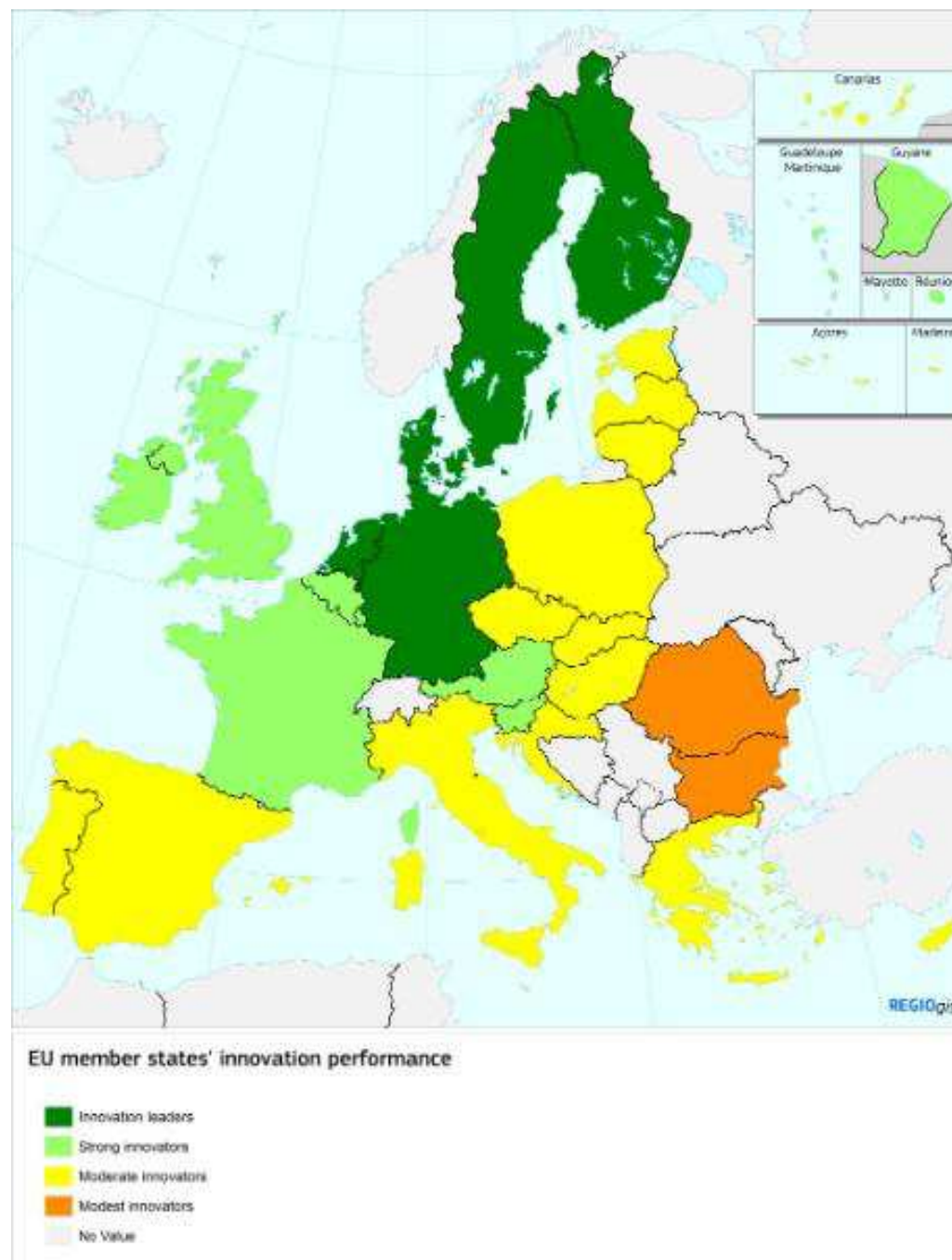




EU Member States' innovation performance in 2015

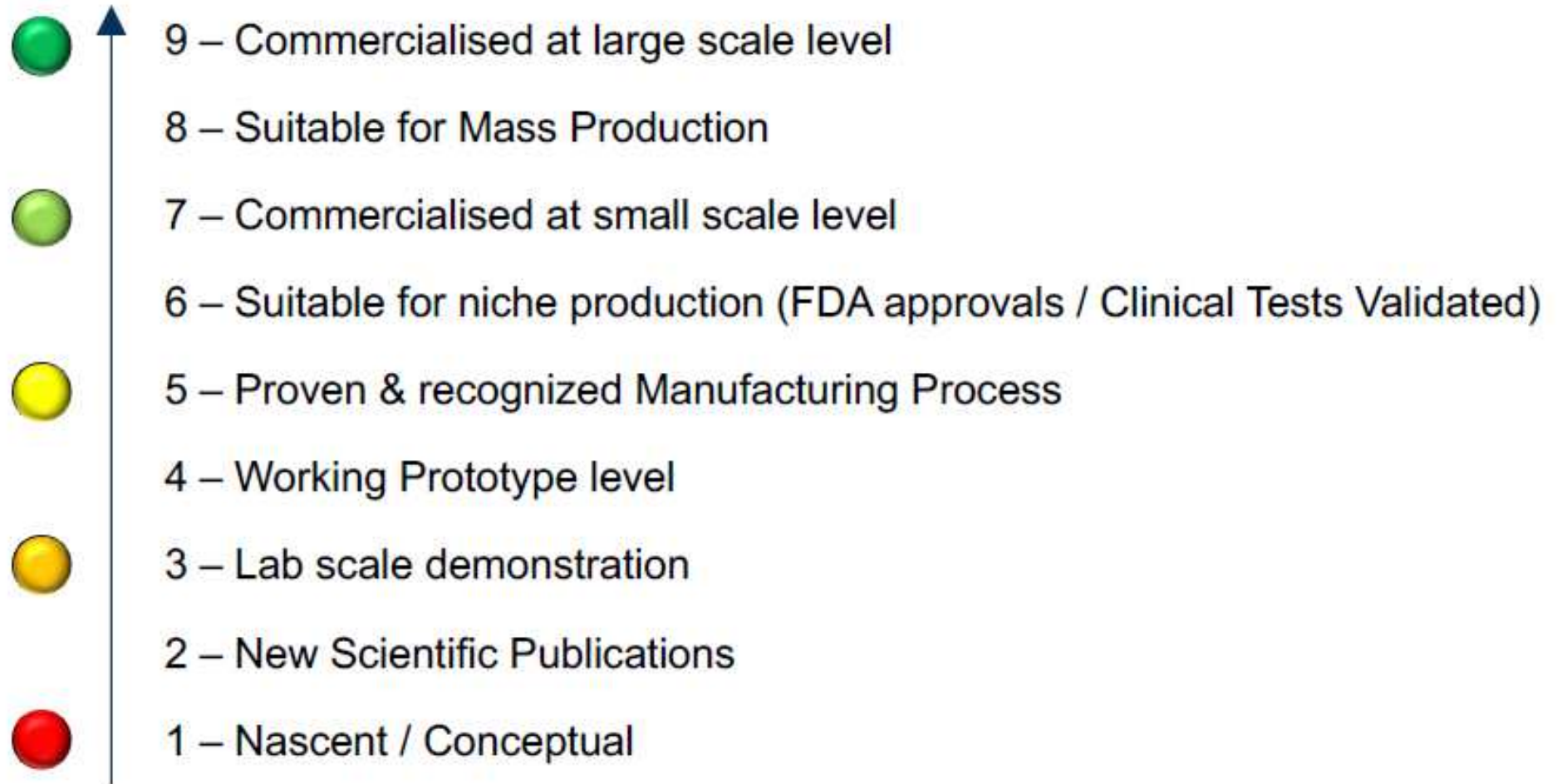
New Innovation Deals to Reduce Barriers to Innovation and Boost Circular Economy

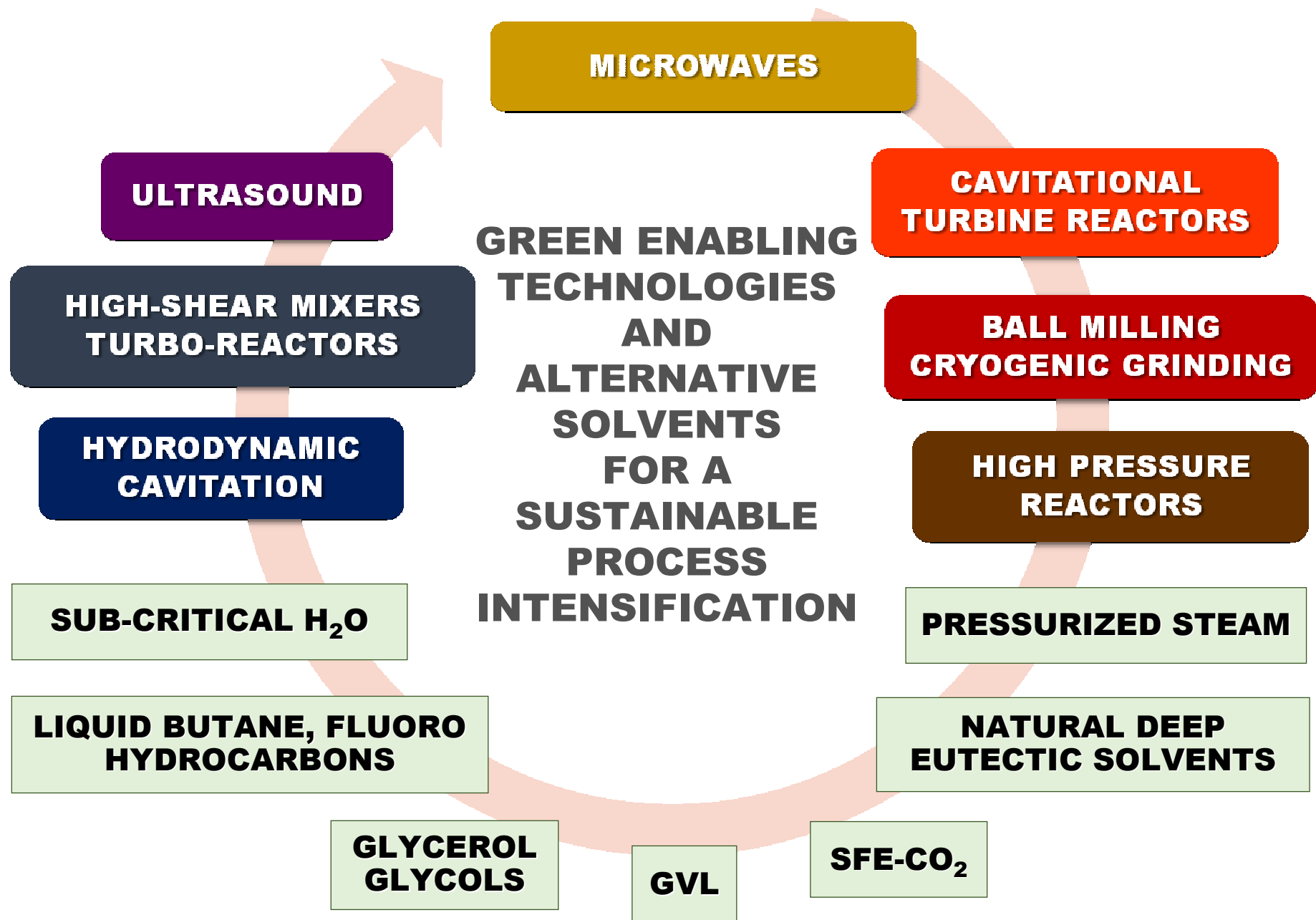
Brussels, 26 May 2016



TRL Technology Readiness Level

a method for estimating technology maturity





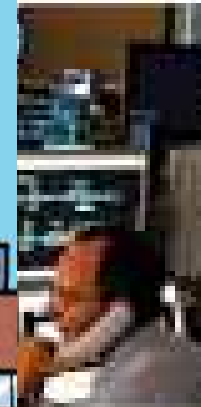
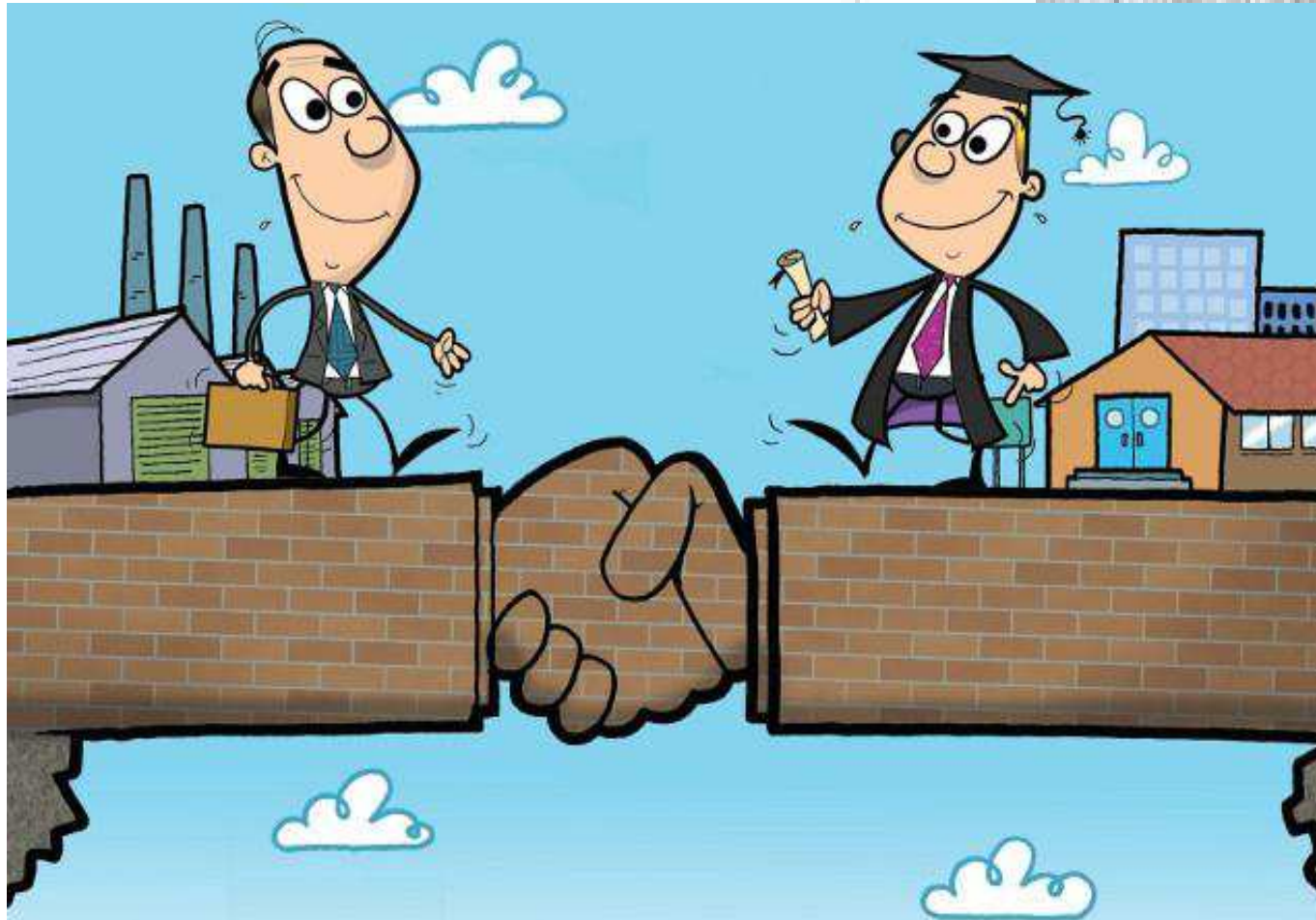
BRIDGING THE GAP BETWEEN INDUSTRY AND ACADEMIA

ITALY | INFRASTRUCTURE

Harnessing innovation to improve performance and safety

TECHNOLOGY IS BEING USED TO BRIDGE THE GAP BETWEEN INDUSTRY AND ACADEMIA, AND TO IMPROVE THE PERFORMANCE AND SAFETY OF INFRASTRUCTURE. THE CHALLENGE IS TO FIND THE RIGHT BALANCE BETWEEN INNOVATION AND TRADITION.

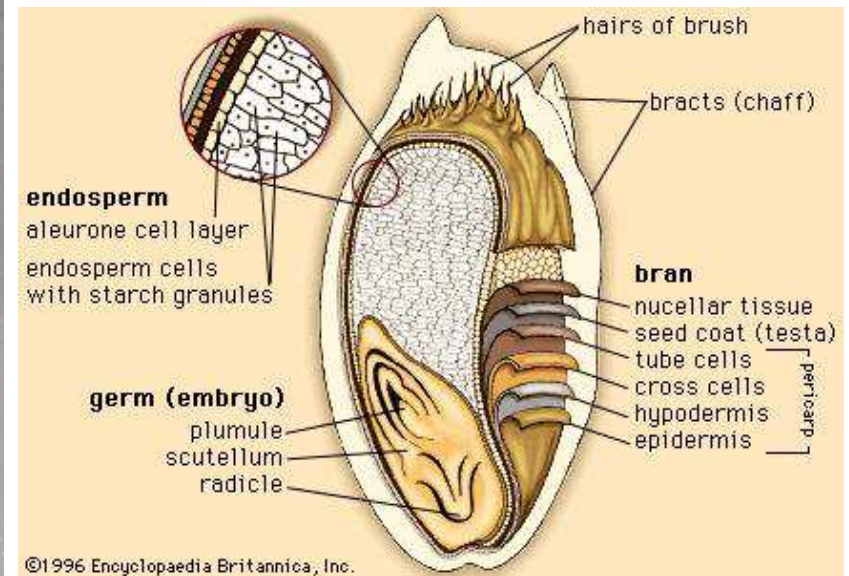
Infrastructure is a key element of any country's economic development. It is the backbone of the economy, providing the means for goods and services to be transported and distributed. However, infrastructure is often outdated and inefficient, leading to delays and increased costs. To improve performance and safety, it is essential to harness innovation and technology. This involves investing in research and development, as well as implementing new technologies and processes. The challenge is to find the right balance between innovation and tradition, ensuring that the infrastructure remains reliable and safe while also being modern and efficient.



PHYSICAL SEPARATION



PHYSICAL SEPARATION

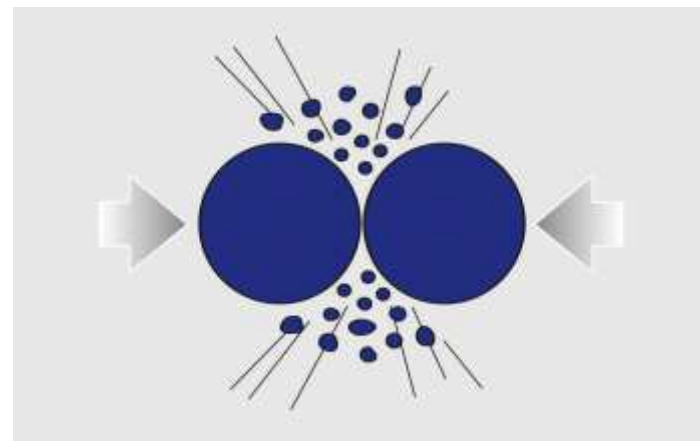


WHEAT

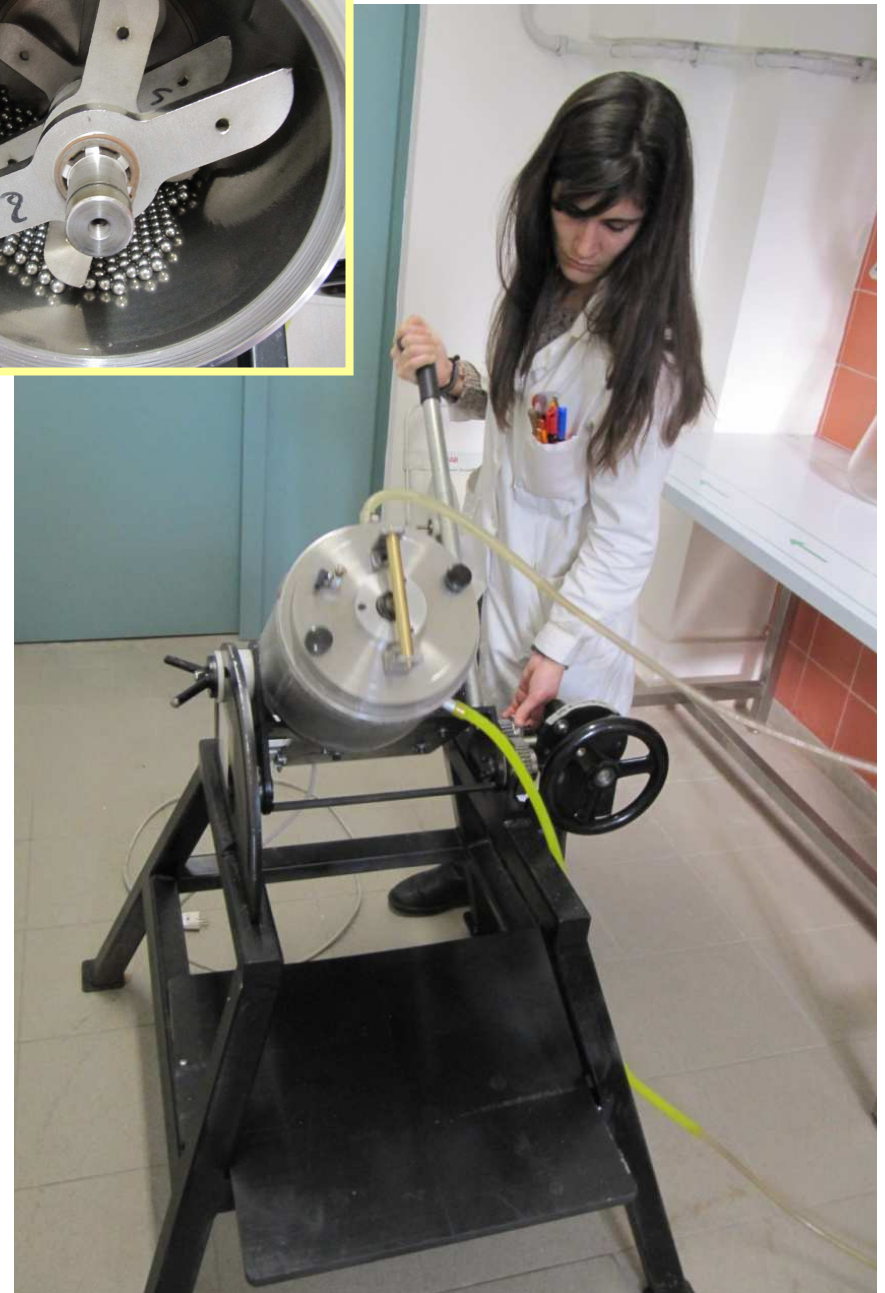
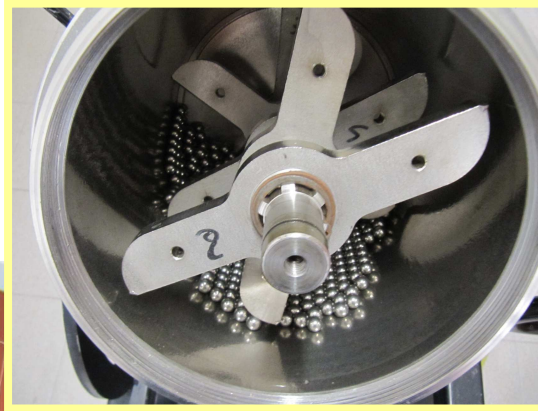
WHOLEGRAIN FLOUR



BALL MILLING - CRYOGENIC GRINDING



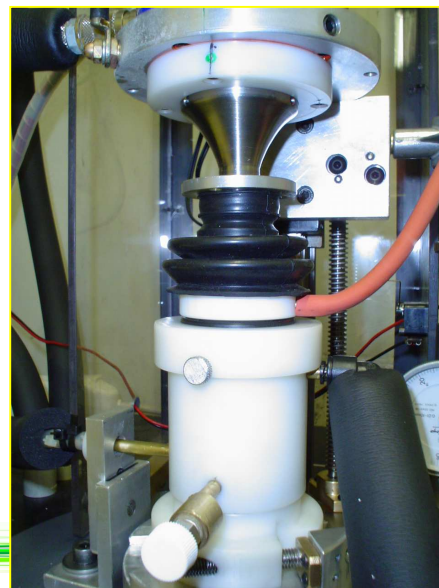
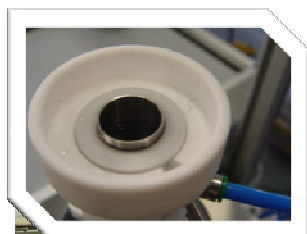
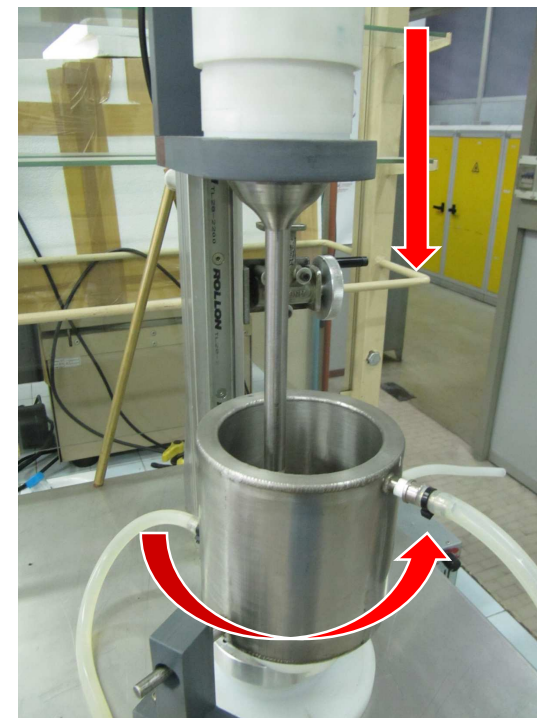
5 L mill

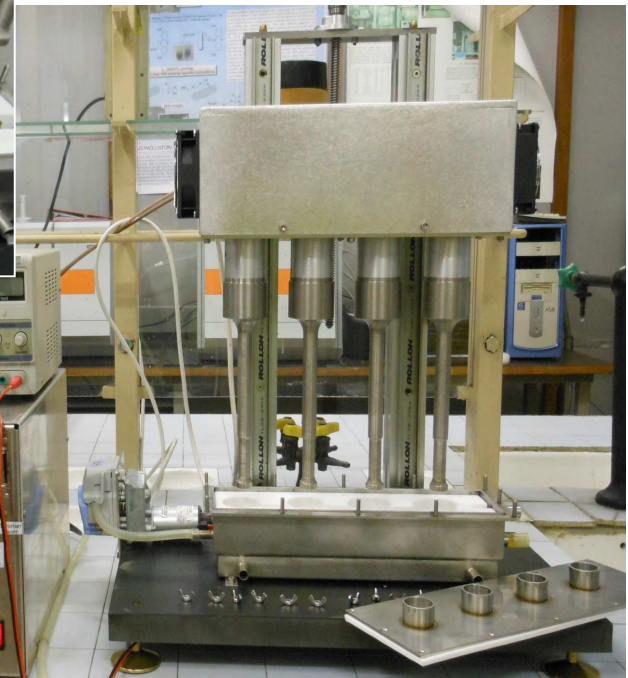
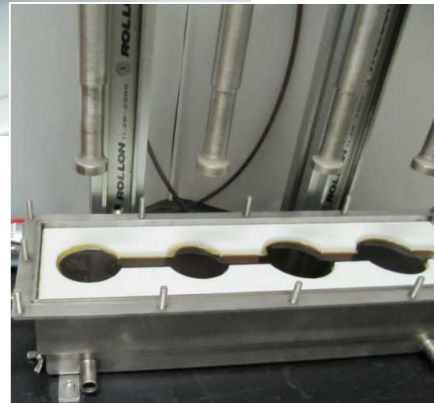
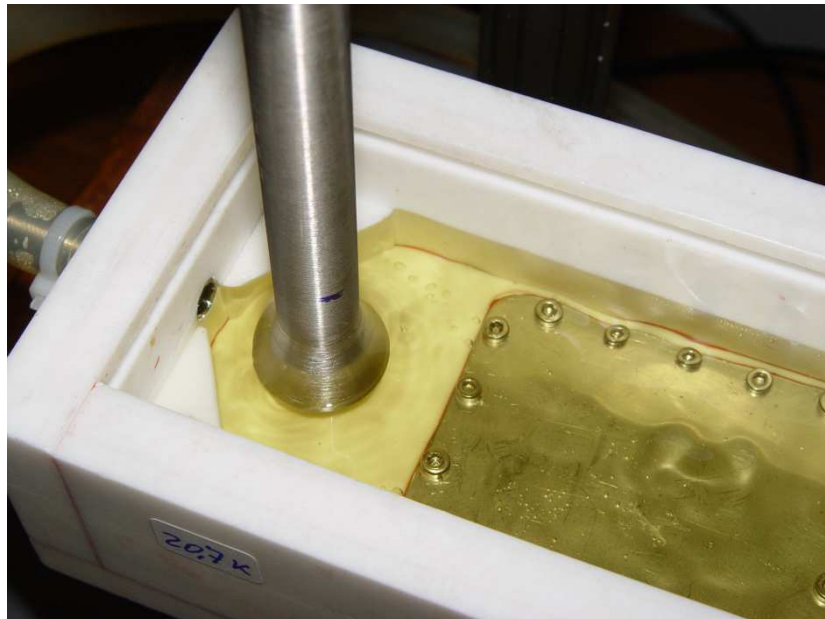
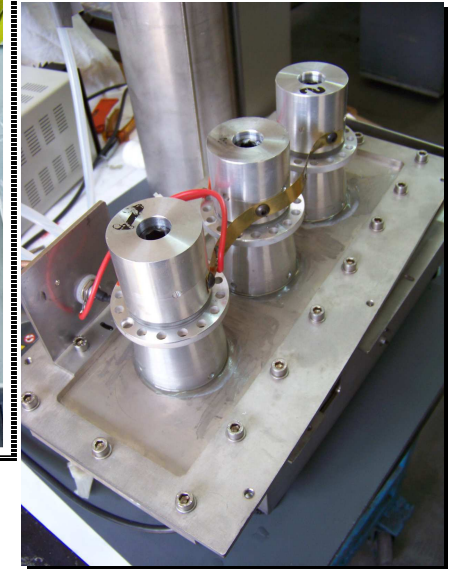
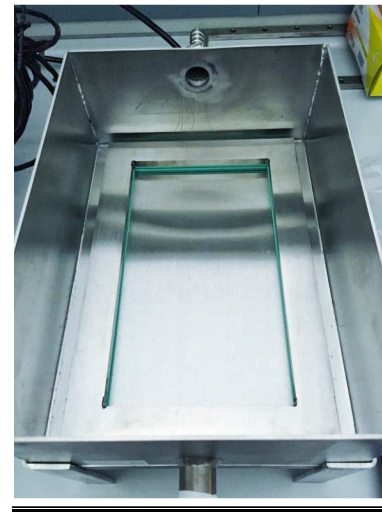


LIQUID BUTANE & FLUORO HYDROCARBONS

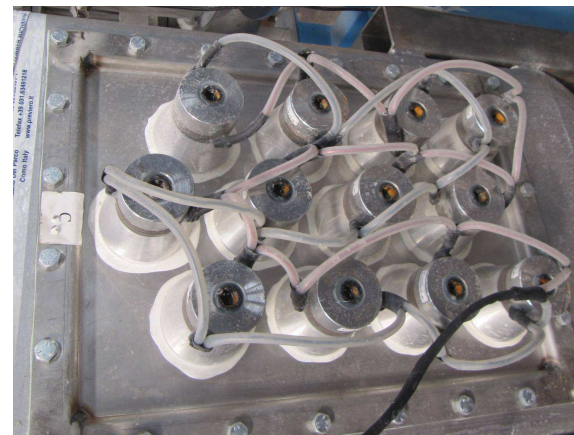
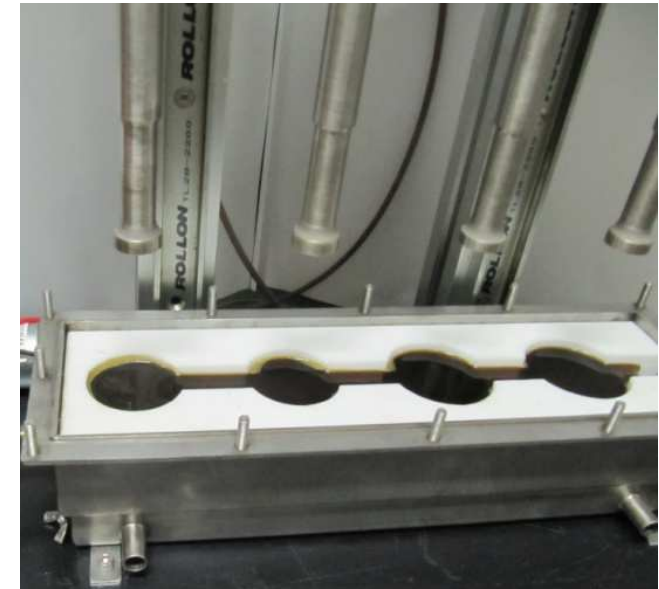
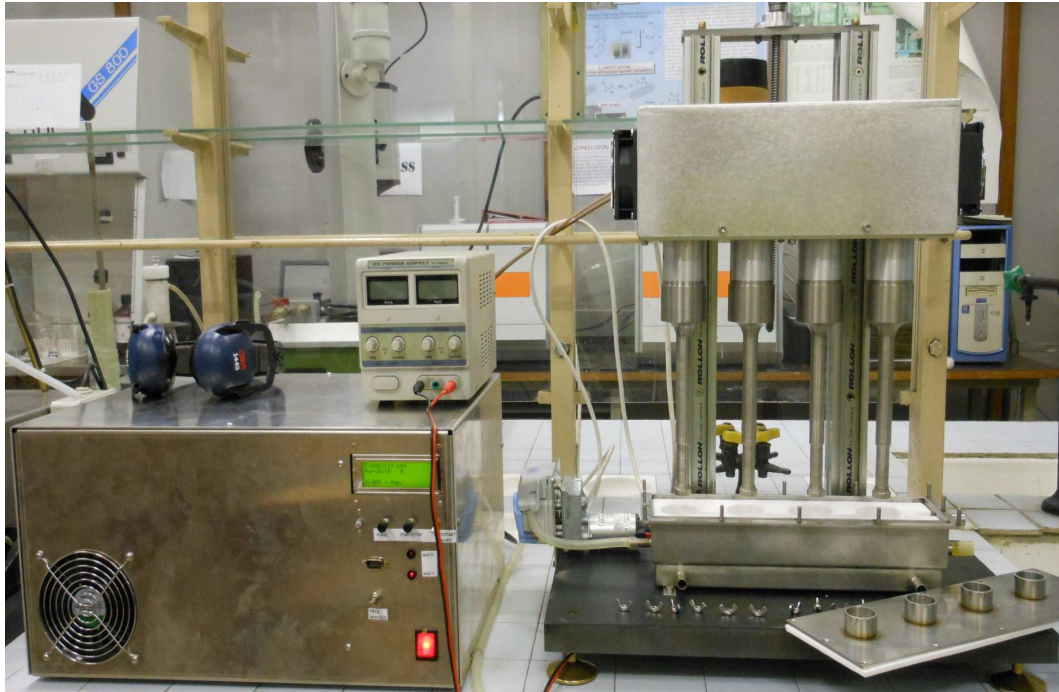


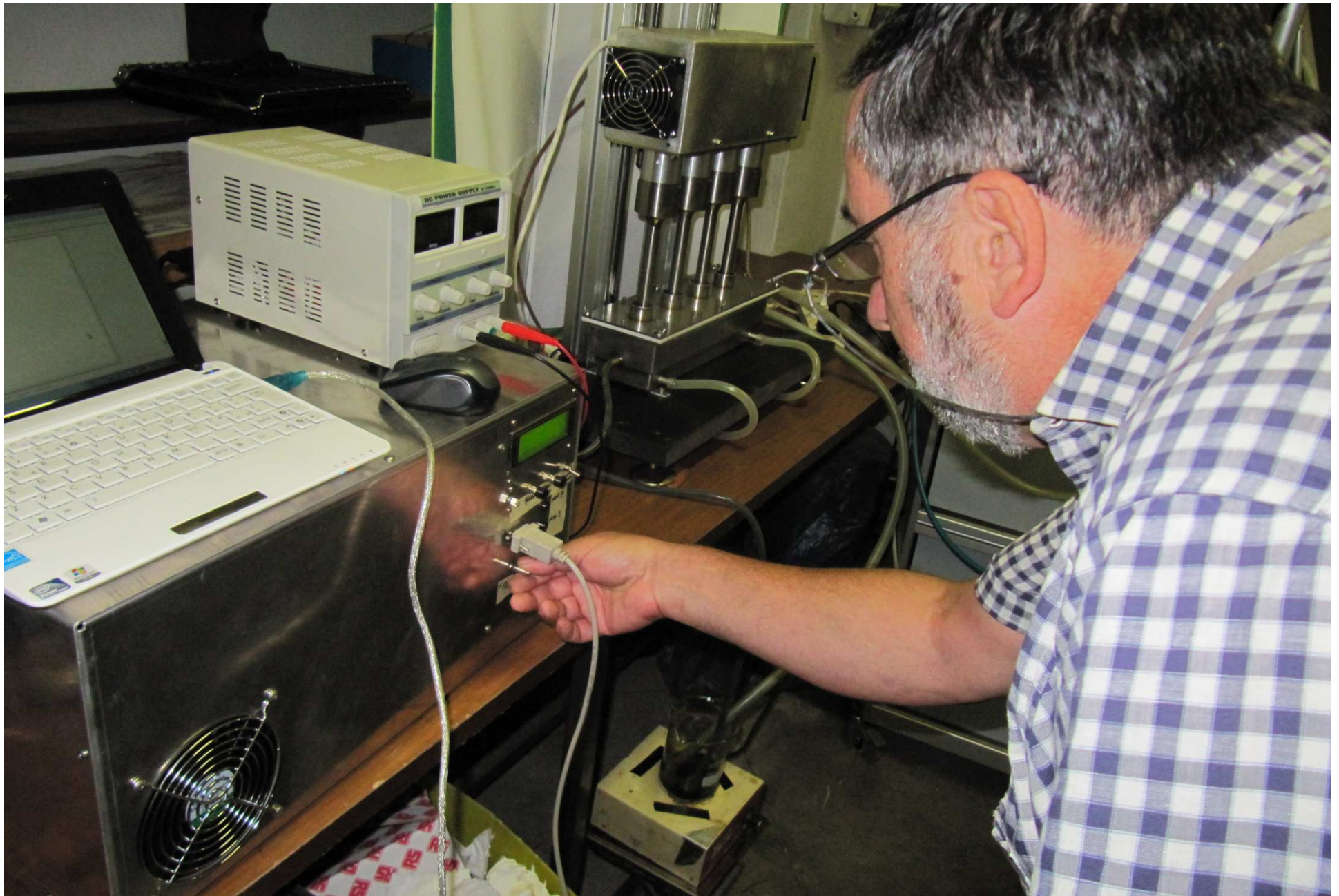
ULTRASOUND-ASSISTED EXTRACTION





ULTRASOUND-ASSISTED FLOW PROCESSES





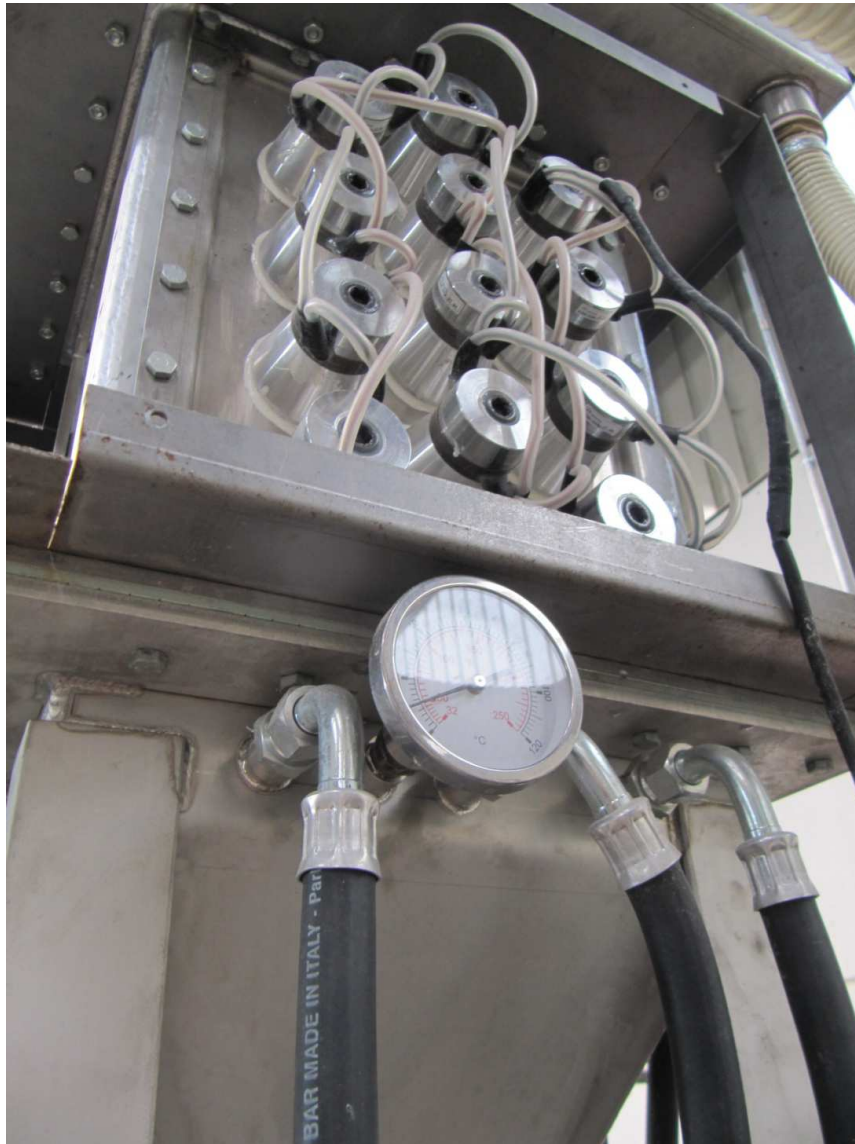
ULTRASOUND- ASSISTED EXTRACTION AND BIOMASS CONVERSION



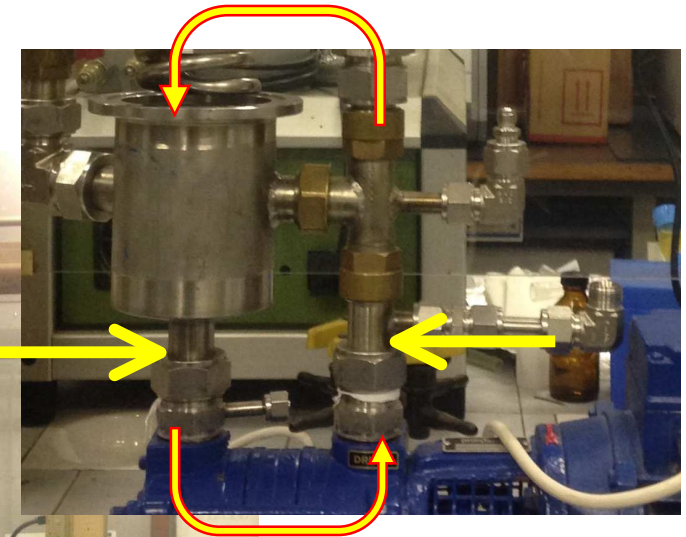
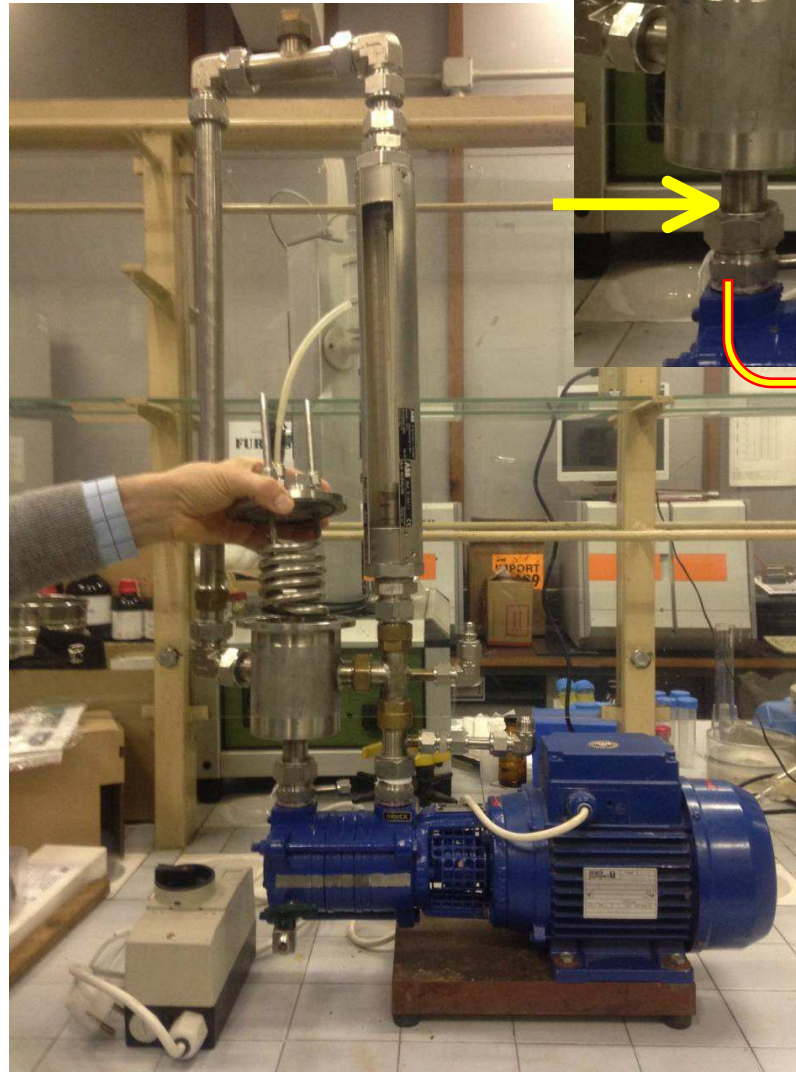
ULTRASOUND-ASSISTED PROCESSES



ULTRASOUND-ASSISTED PROCESSES



CAVITATION BY SUCTION and ULTRASOUND



HYDRODYNAMIC CAVITATION

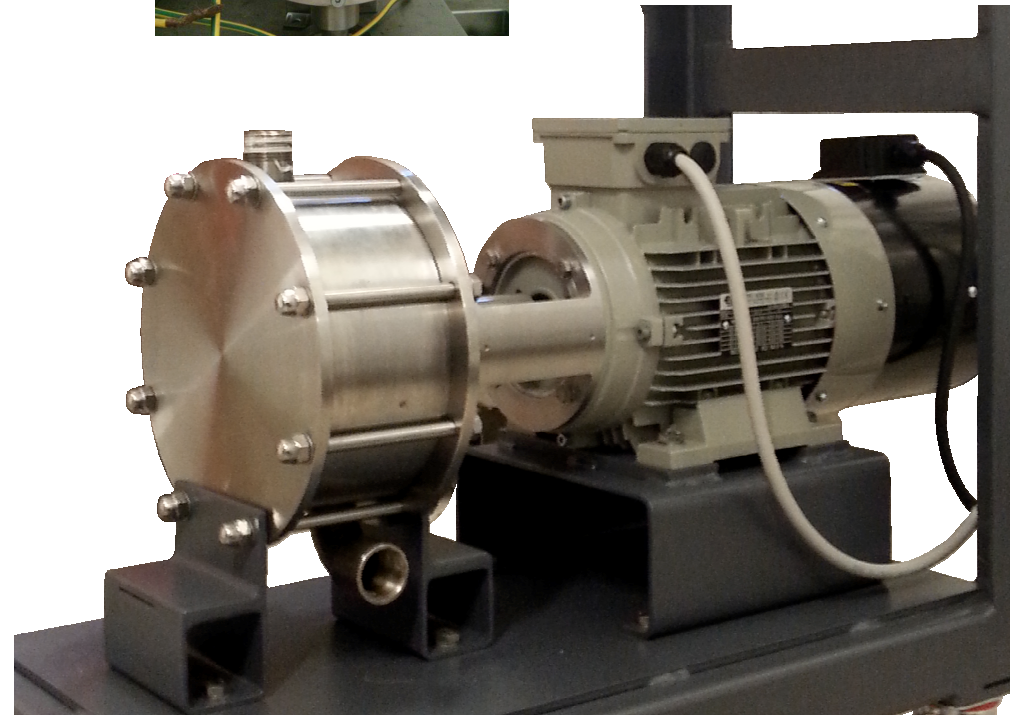
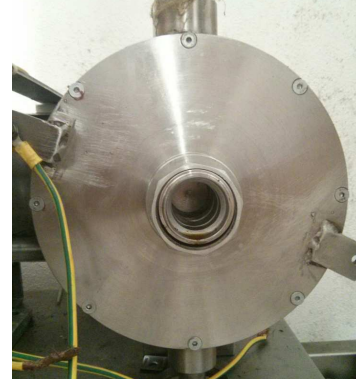
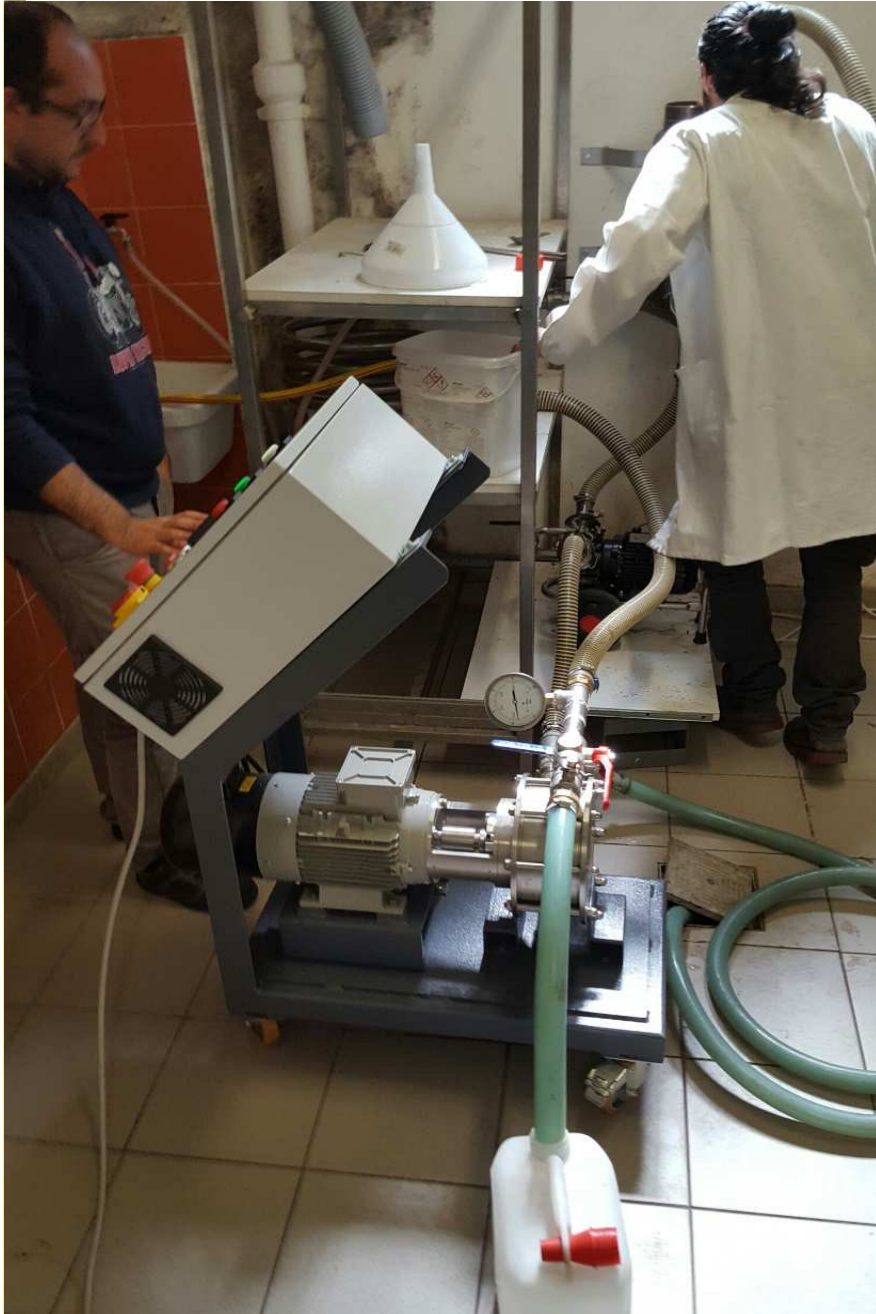




HYDRODYNAMIC CAVITATION (Rotor-Stator Unit)



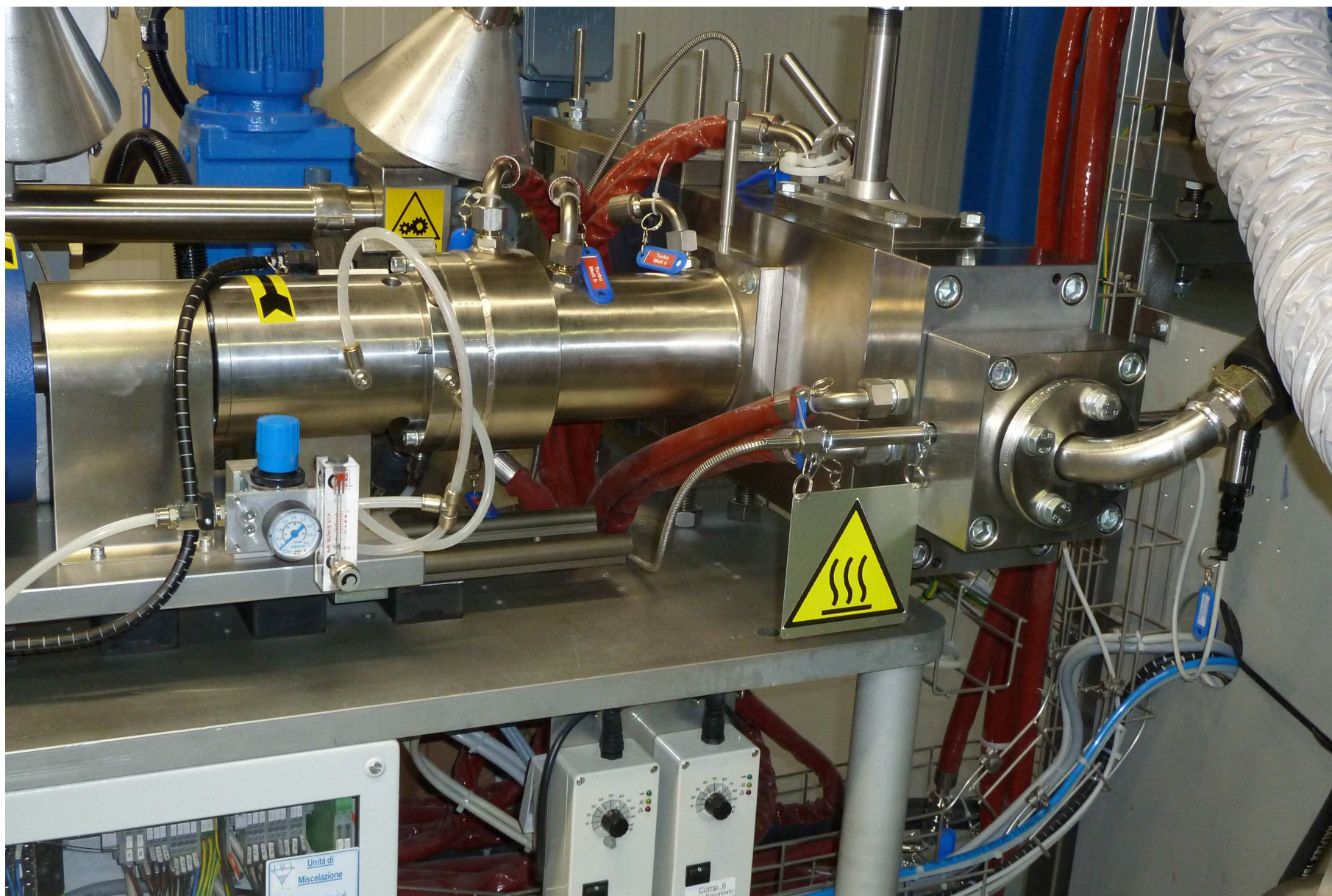
HYDRODYNAMIC CAVITATION (Rotor-Stator Unit)

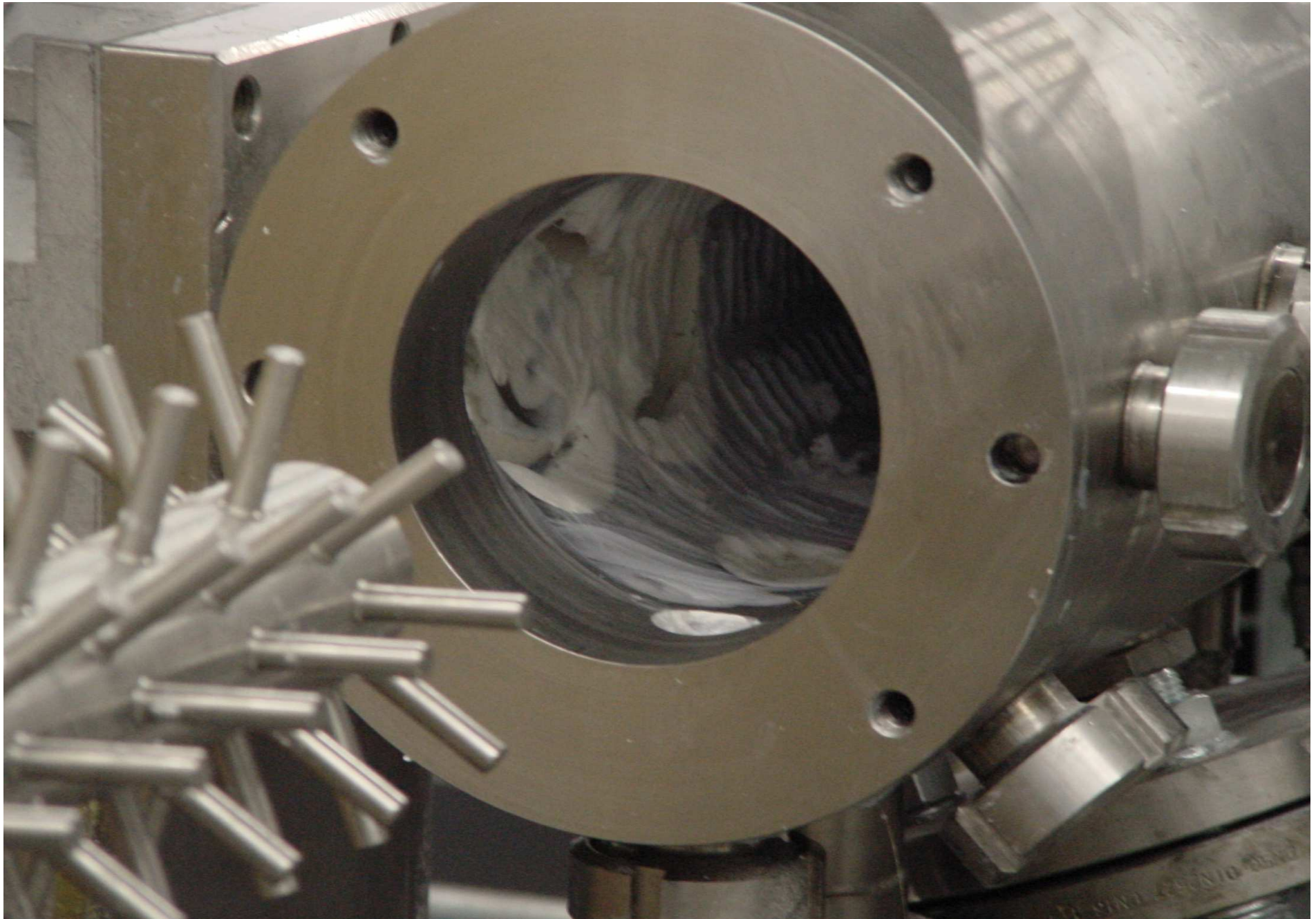


HIGH-SHEAR HOMOGENIZERS



HIGH-SPEED TURBO REACTORS





MICROWAVE TECHNOLOGY



MICROWAVE-ASSISTED EXTRACTION

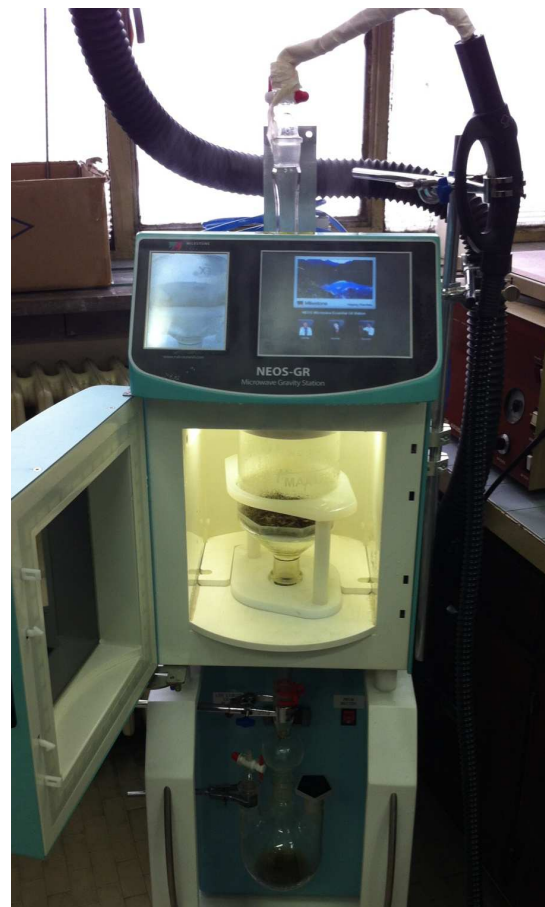
FROM OVEN TO CAVITY AND SEALED VESSELS TO CLOSED CAVITY
“subcritical H₂O”





MICROWAVE-ASSISTED HYDRODISTILLATION

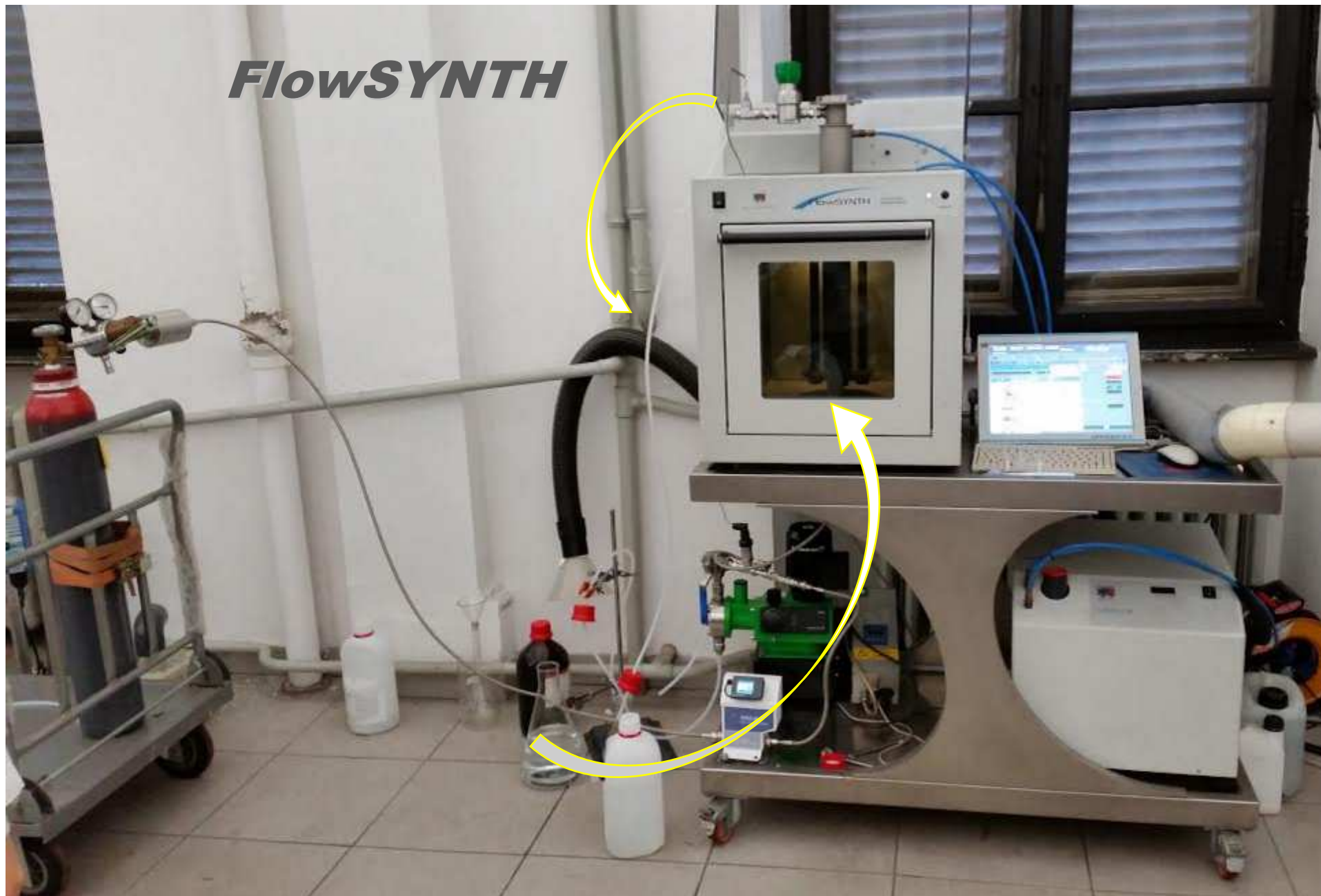
(VACUUM & GRAVITY)







FlowSYNTH



MICROWAVES-ASSISTED INDUSTRIAL PROCESS



FILTRATION & SEPARATION

BAG FILTER



Andritz C3 Separator



SOLID/LIQUID SEPARATION F2000 DECANTER



CALENDERING



SEPARATION: PILOT UNIT

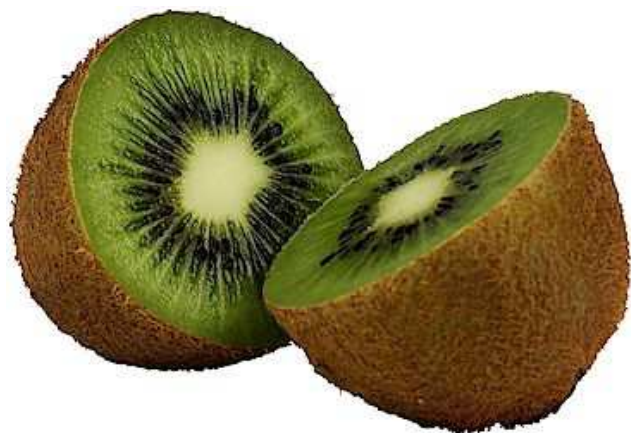
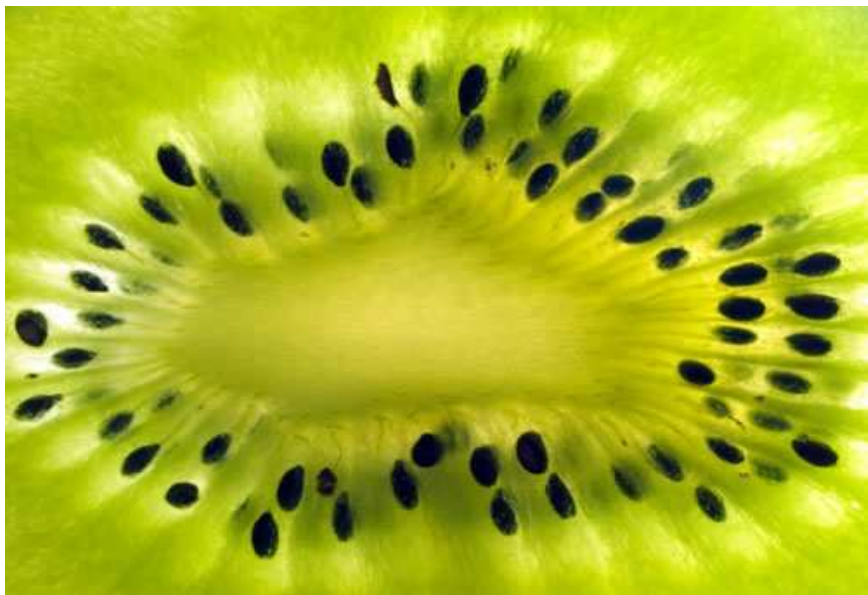
Ultra- micro- and nano- filtration



CONCENTRATION & DRYING



OIL FROM KIWI SEEDS





SEEDS EXPLOSION PRESS



TOMATO PEELS & SEEDS



TOMATO PEELS & SEEDS



Tomato Seed Oil is rich in carotenoid antioxidants including lycopene, lutein and zeaxanthin.

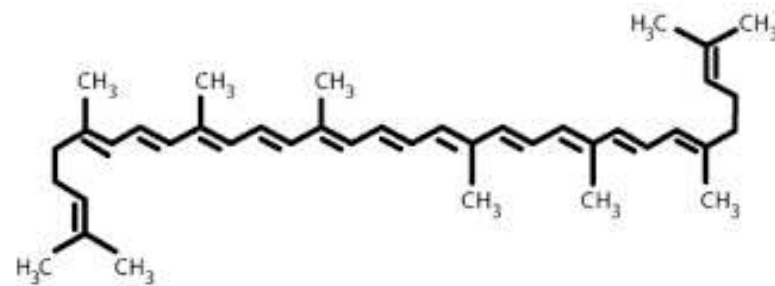
It is also a rich source of polyunsaturated fatty acids, phytosterols and dissolved minerals.

The lipid antioxidants also include different forms of vitamin E.



Fatty Acid Content:

- Linoleic (C18:2) Omega-6 Essential Fatty Acid: >55%
- Oleic (C18:1) Omega-9 Fatty Acid: >24%
- Linolenic Acid (C18:3) Omega-3 Essential Fatty Acid: >2%





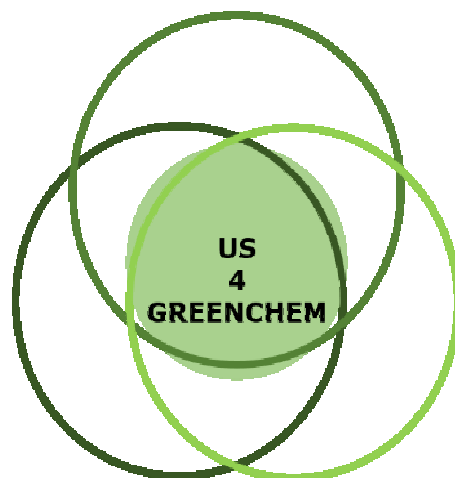
Horizon 2020
European Union Funding
for Research & Innovation



Grant Agreement Number 669055

US4GREENCHEM-

Combined Ultrasonic and Enzyme Treatment of Lignocellulosic Feedstock as Substrate for Sugar Based Biotechnological Applications



**FROM LAB TO
PILOT SCALE DEMONSTRATION**



“From Biomass to bio-based Oligomers of Lactic - Glycolic Acids: a Gram-scale Microwave-assisted Protocol”
ChemSusChem **2015** 8(8), 1342-1349

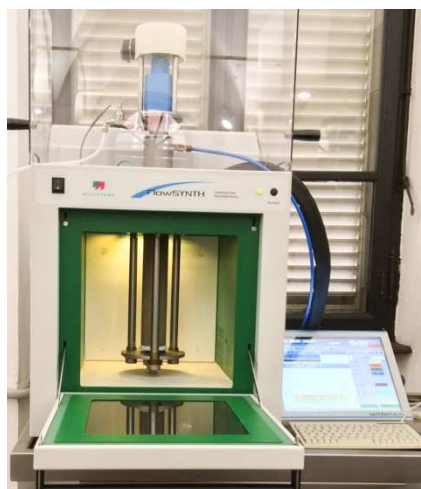
**lignocellulosic biomass
depolymerisation**

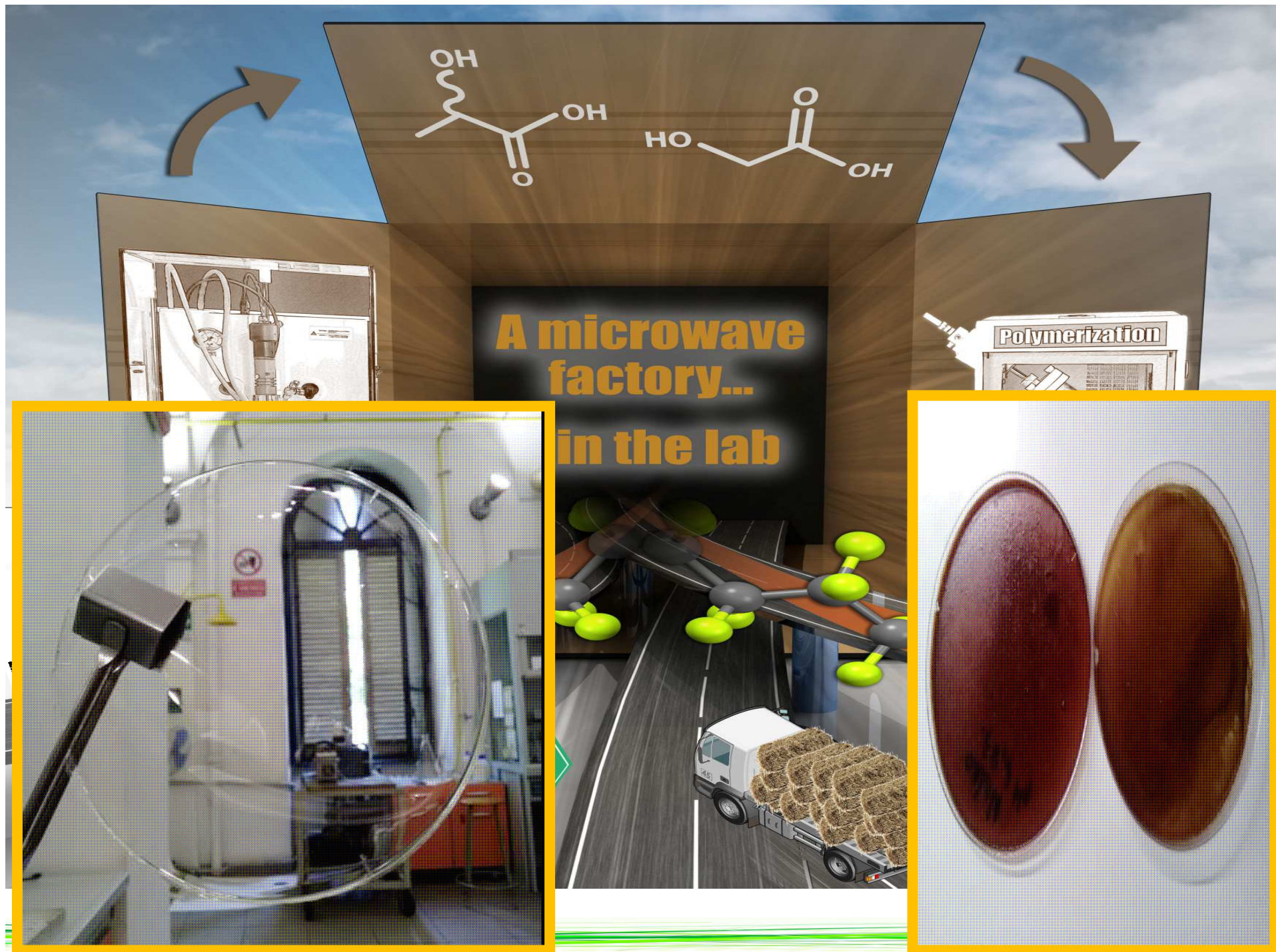


bio-based oligomers



lactic and glycolic acids





EU PROJECTS



M A P S Y N

Development of alternative
energy powered chemical
reactions



US4GreenChem

Combined Ultrasonic and Enzyme
treatment of Lignocellulosic Feedstock as
Substrate for Sugar Based Biotechnnc
Applications



HORIZON 2020



C O S W C

EU MSCA-ETN

Innovative Training Networks (ITN)
H2020-MSCA-ITN-2016

éco-
extraction



COMPETITIVE

Innovative solutions to meet the needs of companies
in the Italian extra virgin olive oil sector

INNOVAZIONE IN CIRCOLO

Pratiche e prospettive di economia circolare in Piemonte



Grazie!