1

ENGINEERING FOR THE SUSTAINABLE DEVELOPMENT OF HUMANITY

Sebastião Feyo de Azevedo

President Portuguese Academy of Engineering (2022-)

President Municipal Assembly of Porto (2021-2025)

Rector, University of Porto (2014-2018)

Dean, Faculty of Engineering, University of Porto (2010-2014)

National Vice-president, Ordem dos Engenheiros (2004-2010)

Correspondence to sfeyo@fe.up.pt

UNESCO WFEO WORLD ENGINEERING DAY

March 4, 2024

Ordem dos Engenheiros Lisbon, Portugal

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TO SAY WHAT I AM GOING TO SAY....

- The core of the message
  1. Engineering for Development, since always... What evolution? And changes?
  2. Thoughts/Ideas I share – Reform, adapt; The evolution of the knowledge spectrum; Values; Work and training models; Innovation and entrepreneurship; Talent retention and attraction
  3. Support the dimension and relevance of Engineering with Engineering cases
- Epilogue - Say what I said…

3

THE CORE OF THE MESSAGE

There is Engineering in everything around us... and outside in the World

- Affirm **the vital role of Engineering in ensuring the future, in promoting the socio-economic development of Countries/Communities**, for a sustainable development of Humanity;
- Affirm that the necessary increase in productivity and competitiveness, for any Nation or Community, is only feasible with the **SYSTEMIC VISION** and the **CAPACITY OF DOING** that characterize Engineering and the Engineers;
- Further affirm, on another level, that Engineering is a condition of the future, through its example of **ORGANIZATION, QUALITY, AND RESPONSIBILITY**, which is so badly needed in so many countries.

It is, therefore, crucial that **institutions responsible for the development of Engineering** commit themselves and impose themselves on the political level so that **engineering is a much more integral part of the design and implementation of public policies**

4

ENGINEERING, SINCE ALWAYS... WHAT EVOLUTION?

- We recognize four Industrial Revolutions, the result of the combination of essentially four factors
  - ✓ New energy sources
  - ✓ Disruptive scientific and technological innovations, with an impact on production
  - ✓ Human Resources capable of absorbing change
  - ✓ A free market society, with investment incentives
- From the steam engine of the 18th century... to the Artificial Intelligence of the 21st century, a sequence of ***qualitative leaps***, of ***so-called vertiginous changes*** in the History of Humanity

With Engineering always at the center of the (R)evolution

5

ENGINEERING SINCE ALWAYS... WHAT (PERCEPTION OF) CHANGES?

Four Industrial Revolutions - human reaction along the times

- The steam engine and the age of steel, with locomotives and steamboats, allowed goods to be "**massively exported around the world**"....
- or the inventions of Thomas Edison (1847-1931) that "**changed the world forever**"
- Or the invention of transistors (1926, 1947) which opened "**times of dramatic change**"
- In fact, we find in literature many other quotes from the past with the same words we use today to characterize contemporary life.

BUT, speaking of the present, IT IS CLEAR

what is the nature, the basis, of the evolution of scientific and technological innovations that brought us the fourth industrial revolution

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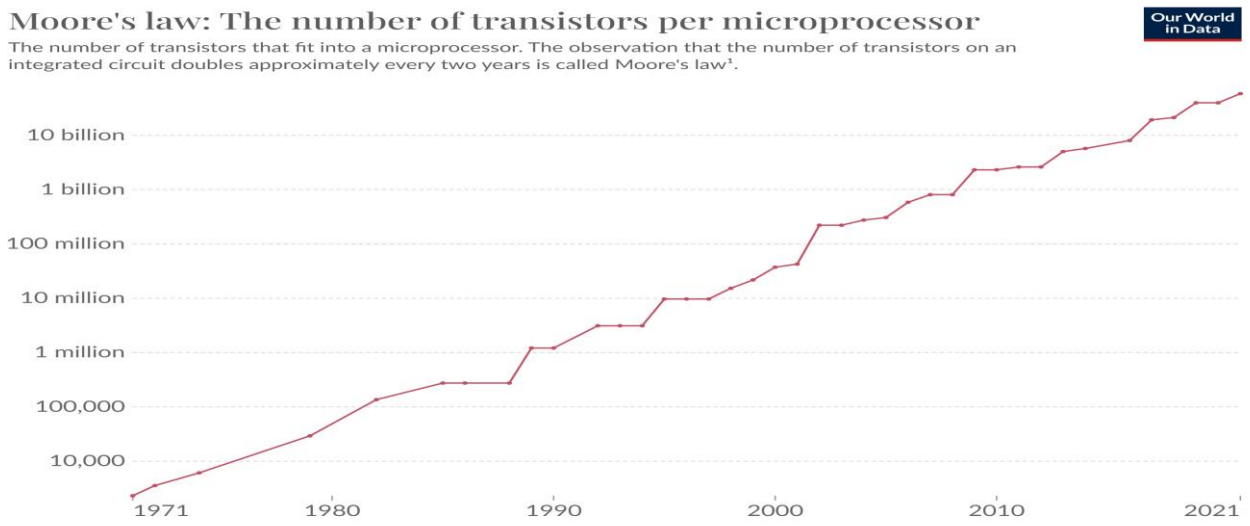
INDICATORS OF THE FOURTH INDUSTRIAL REVOLUTION - I



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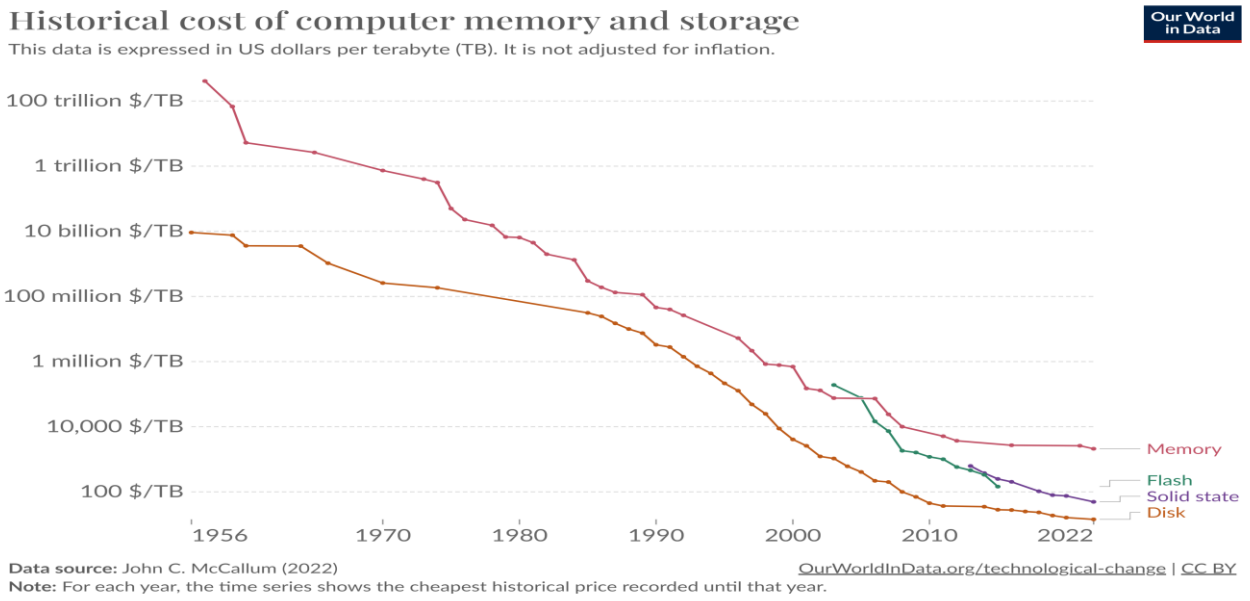
INDICATORS OF THE FOURTH INDUSTRIAL REVOLUTION - II



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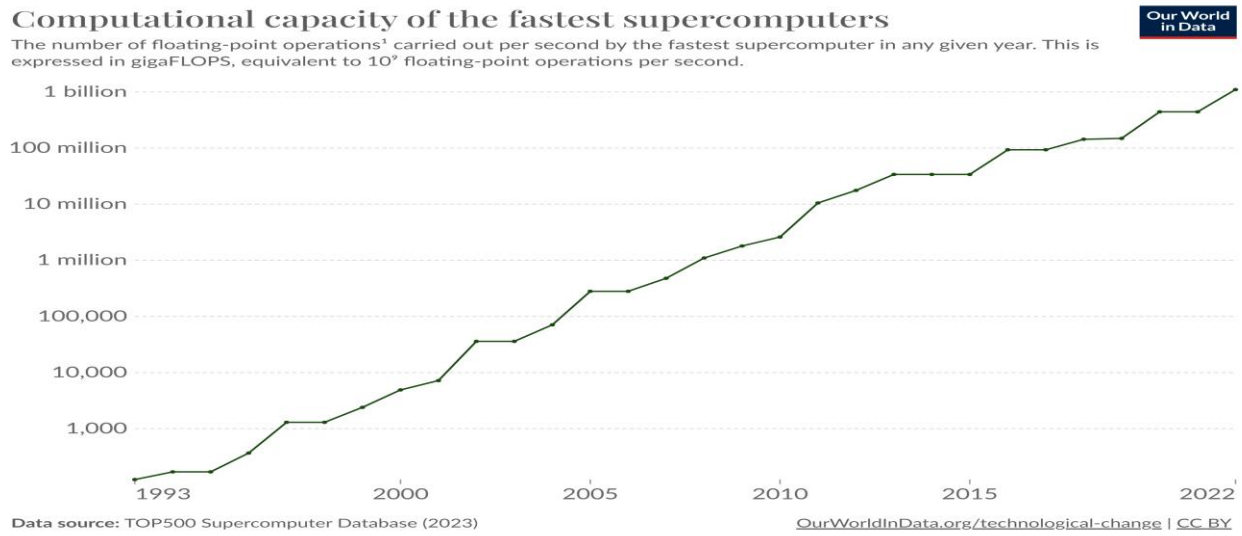
INDICATORS OF THE FOURTH INDUSTRIAL REVOLUTION – III



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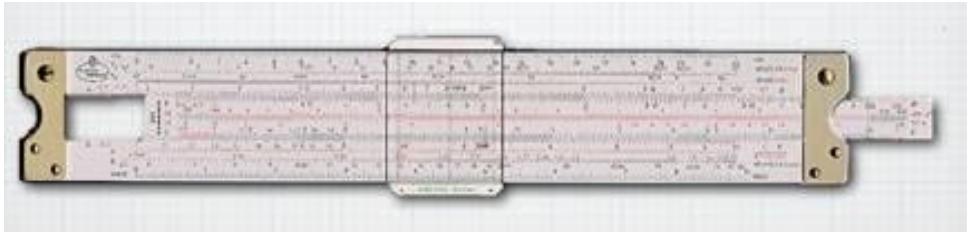
THE EXPLOSION OF SCIENTIFIC CALCULATION CAPACITY
FUNDAMENTAL TECHNOLOGIES OF THE 'UPPER PALEOLITHIC...'

- **John Napier (1550 – 1617) – formulated the concept of Logarithm**
- **William Oughtred (1574 – 1660) - based on the Theory of Logarithms and the concept of Logarithmic Scales, he developed the Slide Rule (?)**



WELL, this Instrument, which really looks like it dates back to the 'Paleolithic', prevailed until 1973

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THE EXPLOSION OF SCIENTIFIC CALCULATION CAPACITY
THE 'REVOLUTIONARY' FACIT MECHANICAL MACHINES (~1960 -)

- What is (was) a FACIT..? Which I learned to use in my father's office, in 1959, and used at College in 1969, 1970...

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INDICATORS OF THE FOURTH INDUSTRIAL REVOLUTION – IV
UNDER THE UMBRELA OF ARTIFICIAL INTELLIGENCE (I)

- AI is today a designation that covers all the methods and technologies that **HUMAN BEINGS DEVELOP**, with which they design Machines that mimic or independently simulate much of **HUMAN ACTIVITY**

- An immense set of applications, emerging every day……..
  - Robots… increasingly 'well trained'
  - CHATBOTS – Virtual Assistants with 'interactive conversations'
  - CHATGPT.. and the new BING with associated CHATGPT

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INDICATORS OF THE FOURTH INDUSTRIAL REVOLUTION– IV UNDER THE UMBRELA OF ARTIFICIAL INTELLIGENCE (II)

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INDICATORS OF THE FOURTH INDUSTRIAL REVOLUTION– IV UNDER THE UMBRELA OF ARTIFICIAL INTELLIGENCE (III)

The Guardian, 6 September, 2019

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THOUGHTS AND IDEAS I SHARE....

- Open mind, Reform, Adapt
- The evolution of the spectrum of knowledge
- Values
- Models of work and of Education
- Innovation and Entrepreneurship
- Retention and attraction of talents

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THE MESSAGE OF TIMES... WHICH IS RELEVANT

OPEN MIND, ADAPT... DEDRAMATIZE

- We are in the midst of the Fourth Industrial Revolution, in times of social and economic changes that new technologies, particularly those that use Artificial Intelligence, introduce into our lives, into our daily lives.
- I completely dedramatize this evolution felt today, which I view, in fact, with great expectations
  - Today, we live in times of changes … as others have lived before
  - Simply, we have to be up to date... as others have had to be before
  - He have to adapt… like others have had before
  - We have to maintain a critical spirit... as others have had to maintain before

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THE EXTRAORDINARY EVOLUTION OF THE SPECTRUM OF KNOWLEDGE

A THEMATIC LIST – TOPICS IN WHICH ENGINEERING HAS A FUNDAMENTAL SAY

i. Construction, housing and general infrastructure
ii. Agriculture and food
iii. Production of new materials
iv. Energy and climate
v. Environmental, economic and social sustainability
vi. Combating climate change and environmental threats
vii. Information and Communication Technologies
viii. Digital Transition
ix. Computing and processing of 'Big Data'
x. Artificial Intelligence Methods
xi. Innovation and emerging technologies in areas such as microelectronics, robotics, genetic engineering... and others that still have no face
xii. The paths of the energy transition
xiii. Electrification in transport, industry... and beyond...
xiv. Major problems associated with the scarcity of natural resources – WATER at the top
xv. Science and Innovation
xvi. The Organization and Management of the Territory
xvii. Social Integration
xviii.....

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VALUES, TODAY, AS YESTERDAY... IN THE UNDERSTANDING OF THE TIMES...

- **Trust -** In free, market Societies, Trust is the most important value to guarantee Development - without Trust, Society falls apart
  - associated with the perception of stakeholders, concerning our quality, organization, rigor, stability, and ethics
- **Ethics -** The most discussed of values... since the Philosophers of Ancient Greece, nowadays involving respect and courage in assuming professional and moral responsibilities, always in a transparent way
- **Ambition -** of a different nature, a very important state of mind, for a Nation/Community to have a future, obviously thinking of the global competitive World of Today

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Models of Work... And Training

- Work and training in hybrid mode
- Work and training increasingly dematerialized
- Requirement to adapt spaces, in companies and training institutions
- Perception of the multidisciplinary nature of practically all processes, leading to the requirement of multidisciplinary Teams
- Perception of the requirement for multiculturalism,
  - the 'World has shrunk', World cultures are closer than ever… in real-time
- Perception that we live in a 24/7 World, with the appropriate adaptation of work organization

Adapt the critical spirit to current communication models and AI instruments –

Critical Spirit that has always been required throughout times

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Innovation and Intrepreneurship

- Science for Humanity – the example of the fight against the COVID-19 pandemic
- Today, the degree of development of Science in a country says all about the country's state of development, particularly its competitive capacity
- It is important to implement public policies, aiming to incorporate Knowledge, particularly in the form of Innovation, in the Productive Market – Valuing Knowledge
  - Increase Projects, involving 'Research Institutions – Industry'
  - Promote PhDs with Industry
  - Promote the insertion of doctorates directly into the productive fabric
  - Promote entrepreneurship – support Science and Technology Park, Technology Valorization and Transfer Centers, and other institutions aimed at starting companies

Globally - bring Scientists to the Market;

Value Knowledge in a tangible way

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Talent Retention and Attraction

As relevant as tough social and political objectives in all Countries

- For Portugal, retaining and attracting Portuguese, EU Nationals, Nationals of Portuguese-speaking Countries and Nationals of Third Countries **is today identified as a major policy for development**
  - ✓ Young Portuguese are generally very well trained in Engineering
  - ✓ Availability and motivation to go abroad is high, namely for European Countries
  - ✓ Currently 30% of young people born in Portugal work somewhere in this World, out of Portugal!
- **So, create and /or improve conditions of attractiveness**
  - ✓ Of course, promoting salary improvements... for Young People, through various mechanisms ...
  - ✓ Including strengthening major motivation and achievement initiatives – entrepreneurship...

Essentially - Young People must feel that their country, or the country where they are, is developing and that it will provide them with opportunities to achieve their goals/dreams

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Now, specifically about Engineering in Portugal

(I) Public perception and action

- I rate that Engineering is publicly recognized as a major asset for our development – Engineering is doing well, within Portugal and all over the World
  - ✓ Companies capable of competing internationally
  - ✓ Excellent Higher Education in Engineering – young people well prepared
  - ✓ Competitive high-level research
- The issue is largely on the real capacity of our institutions/associations to be able to influence the design and implementation of public policies, namely, thinking of quality, education and the economy
  - ➢ The Academy of Engineering
  - ➢ Engineers Portugal (Ordem dos Engenheiros)
  - ➢ Universities
  - ➢ Industrial associations

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NOW, SPECIFICALLY ABOUT ENGINEERING IN PORTUGAL (II) THE ROLE OF *ENGINEERS PORTUGAL*

- ***Engineers Portugal*** **is doing a fine job in promoting engineering - recognizing new areas of engineering , promoting quality, promoting internationalization, promoting lifelong learning, and fighting for adequate public policies**
  - ✓ **Currently, recognizes 17 specialties, 5 of them 'new' - Aeronautical and Space Engineering; Food Engineering; Biomedical Engineering; Engineering and industrial management; Safety and Quality Engineering**
  - ✓ **Promotes periodically in its Journal the discussion of major hot topics - Regional Development; Energy and Climate; Construction, Housing, and Infrastructures; Blue Engineering, a Sea of Opportunities; Food and Process Chain Engineering**
  - ✓ **Recently published "Engineering XXI" - an important publication that illustrates 144 notable engineering projects and works**
- **Engineers Portugal is undoubtedely a major asset for Portuguese Development**

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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING – CASE STUDY 1

A classical Engineering Project in its development

From the Lab to the Pilot, to the Plant

Today, ACS – Advanced Cyclone Systems,

Founder and Responsible - Prof. Romualdo Salcedo

- **Cyclone systems for Gas-Solid separation, internationally recognized worldwide as as of very high efficiency - solves many critical gas-solid separation problems**
- **History started at FEUP almost 40 years ago**
- **Project with solid scientific bases of separation processes, mathematical modeling and optimization**

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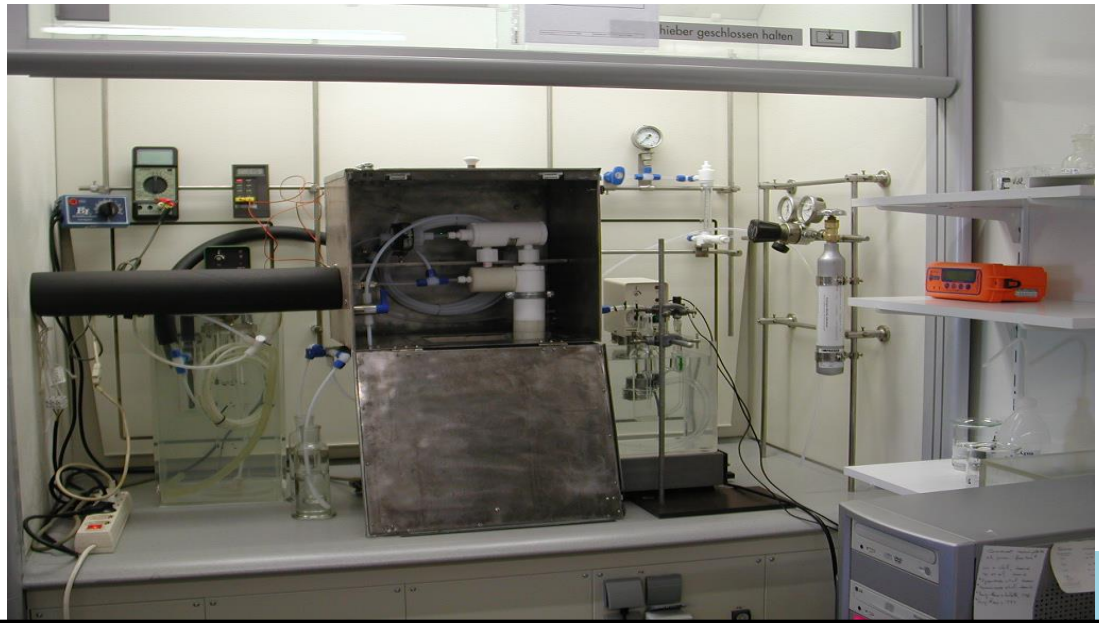
STARTED AT LAB LEVEL



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WENT THROUGH PILOT SCALE

26

ENDING UP WITH INDUSTRIAL SCALE (I)

Installation at SONAE, a major Portuguese industrial company

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ENDED UP WITH INDUSTRIAL SCALE (II)

SSB – Brasil

188000 m^3/h@150ºC;

<100 mg/Nm^3

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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING

ACS - FACTS & FIGURES, AS OF TODAY...

- 23 workers – 2 PhDs, 20 with master (second cycle) degrees
- National Prize of Environmental Innovation, 2008; SME Lider em 2015, 2016, 2023
- 350 Customers
- 38 Countries
- 5 Continents
- 280 installations for emission control
- 120 installations for recovering valuable materials
- 95% of revenues, from exports

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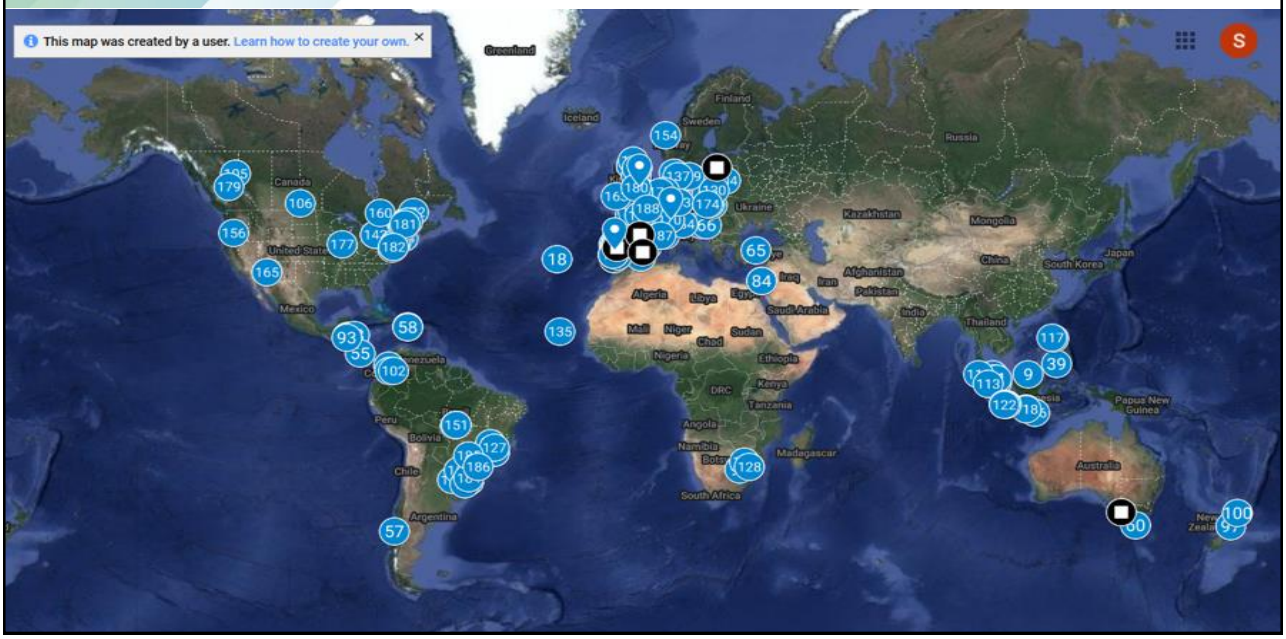
ACS – DISSEMINATION WORLDWIDE...



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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING CASE STUDY 2

Another classical Engineering Project in its development

From the Lab to the Pilot, to the Field

Today, BERD, One Bridge, One Solution -
President and CEO - Prof. Pedro Pacheco

- **History started in FEUP, almost 20 years ago**
- **Recognized among World Leaders in the area of Bridge Construction Methods and Solutions – movable scaffolding systems, with organic prestress**
- **Continued scientific investment - New SPIN-OFF "BRIDGE INTELLIGENCE & A.I."**

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BERD®
ONE BRIDGE, ONE SOLUTION

32

BERD®
ONE BRIDGE, ONE SOLUTION

- **Multiple national and international awards**
  - ✓ **In Portugal – COTEC Award**
  - ✓ **In Europe - EUROPEAN STEEL BRIDGES AWARD**
- **5 PCT Patents**
- **1 Patent examined and granted in more than 60 countries**
- **Optimization of bridge solutions in several countries**
- **Frequent publication of scientific papers**

33

BERD®
ONE BRIDGE, ONE SOLUTION

- **PARTICULARLY RELEVANT PROJECT published in Structural Engineering International, with a reduction of more than 400,000 Ton of materials (~30%+) and ~28,000 Ton of CO2 emissions**
- **The M1-90-S movable scaffolding system operated in Turkey, in the construction of the deck of four viaducts of the Ankara – Sivas High-Speed Railway Line.**
- **Set a world record by building 90 meter spans in just 12 days, using the in situ concreting method**

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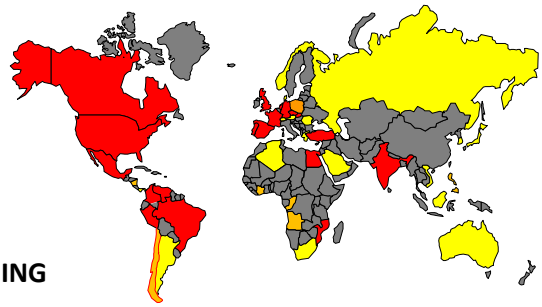
BERD®
ONE BRIDGE, ONE SOLUTION

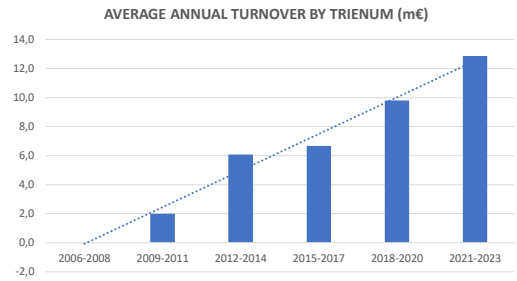
ELITE TEAM: **APROX. 60 Workers**
(5 PhD, +20 MSc)

CUSTOMERS / PROJECTS: **5 CONTINENTS**

INCOME GROWTH **> 16%/YEAR, FROM THE BEGINNING**

WEIGHT OF EXPORTS **> 95% OF BUSINESS VOLUME**





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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING
CASE STUDY 3

(Hidden) Engineering in large rehabilitation/renovation projects

Rehabilitation of
Super Bock Arena - Rosa Mota Pavilion

Lúcios – Engenharia e Construção

Coordination Eng. Filipe Azevedo

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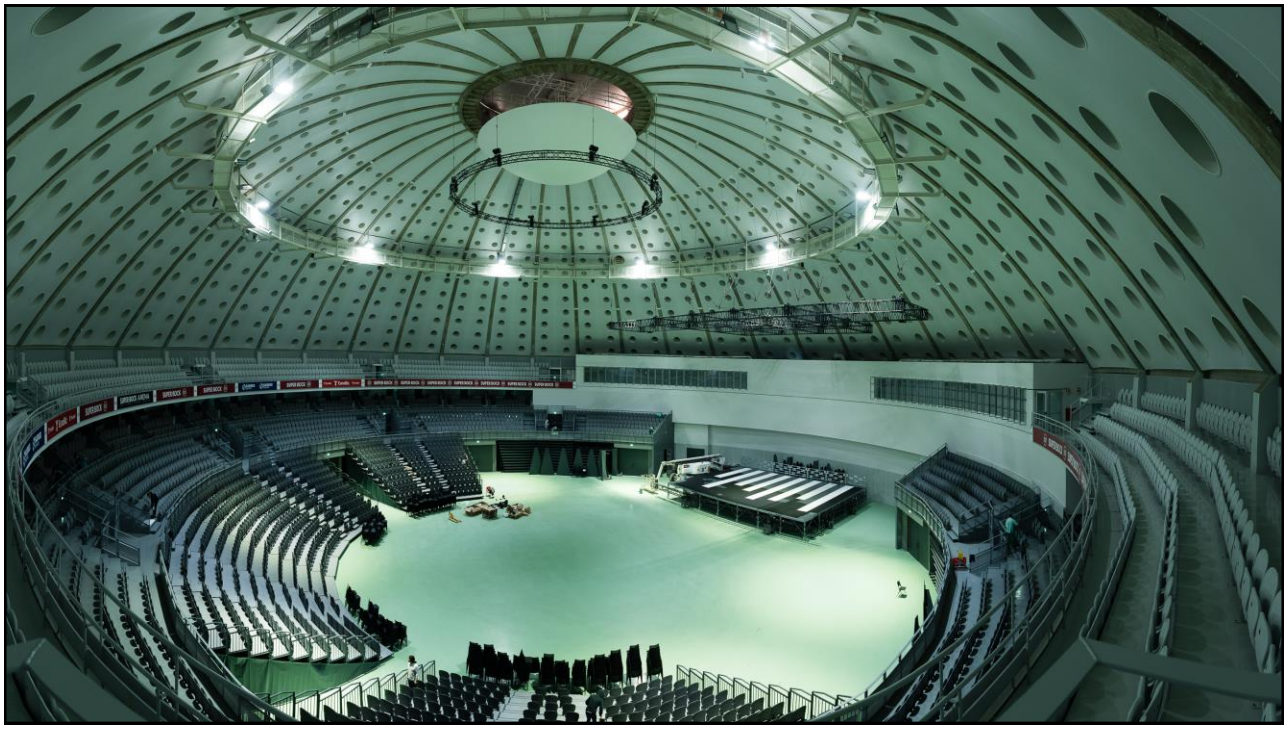

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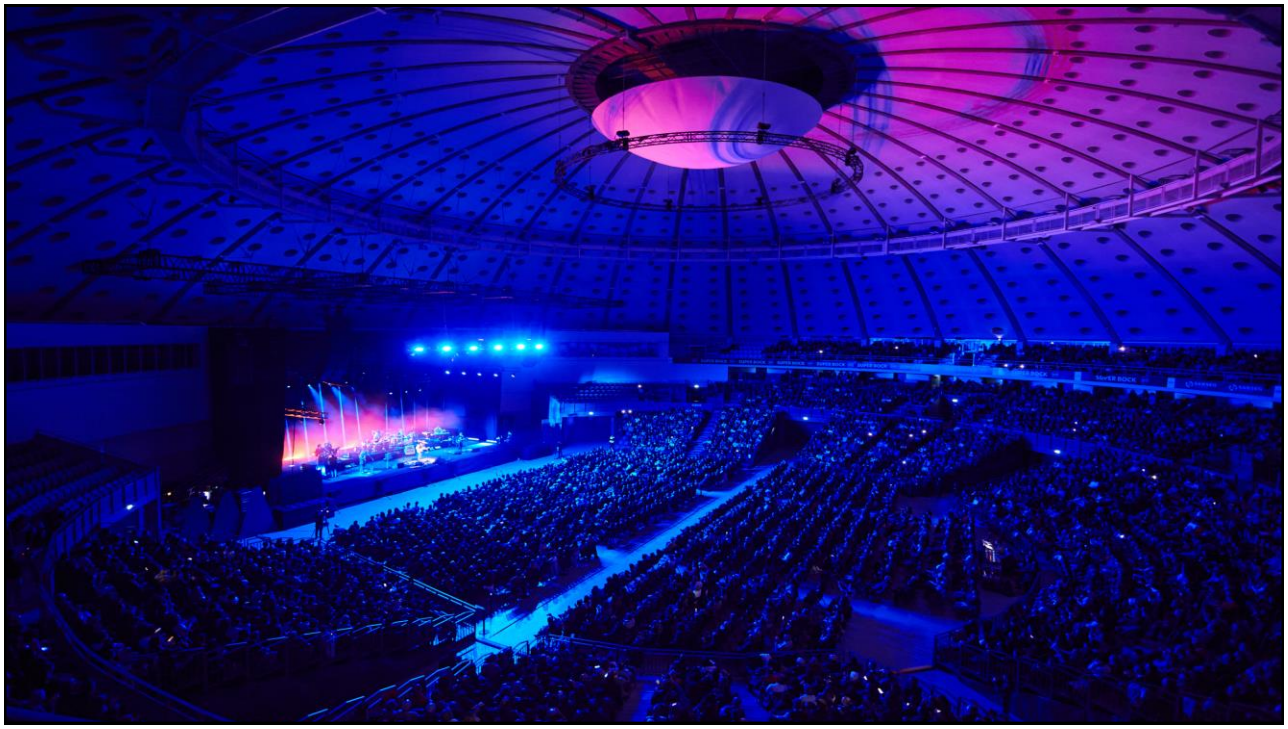

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Engineering in large rehabilitation projects

Super Bock Arena -

Rosa Mota Pavilion

Dome

39

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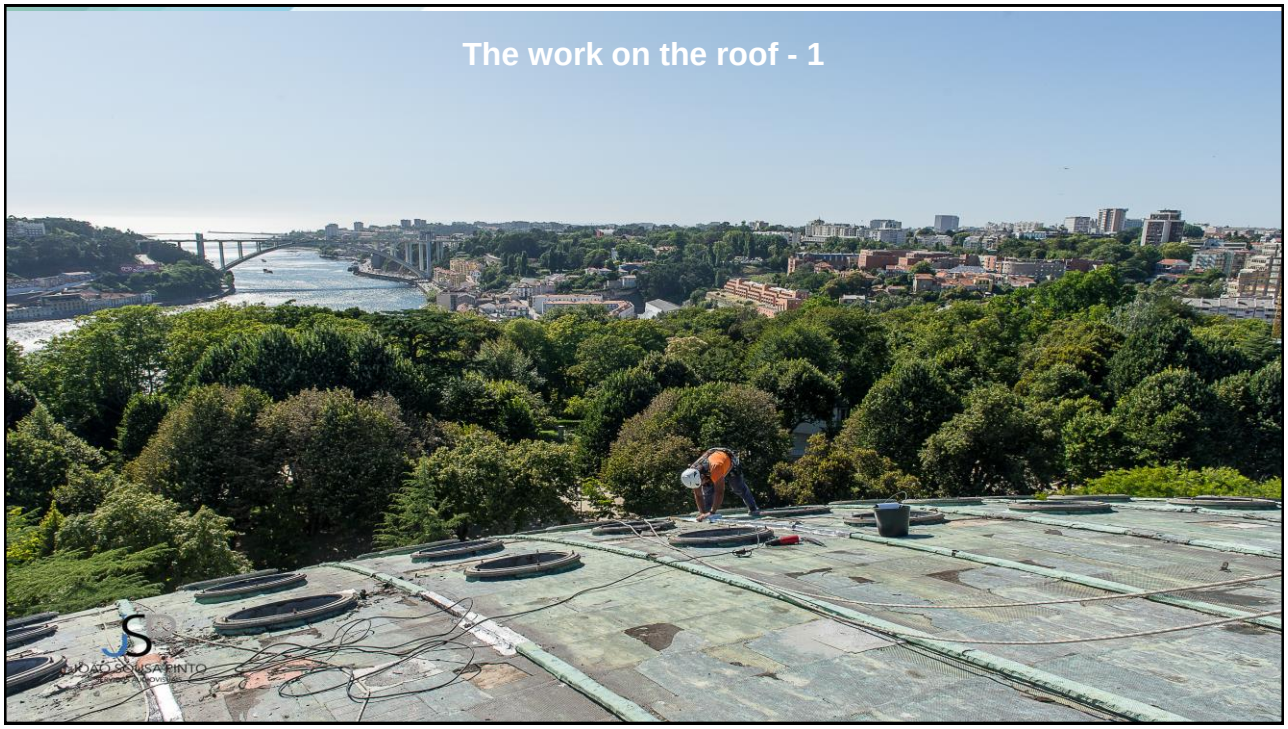
The work on the roof - 1



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The work on the roof - 2

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Lower the lower floor - 1

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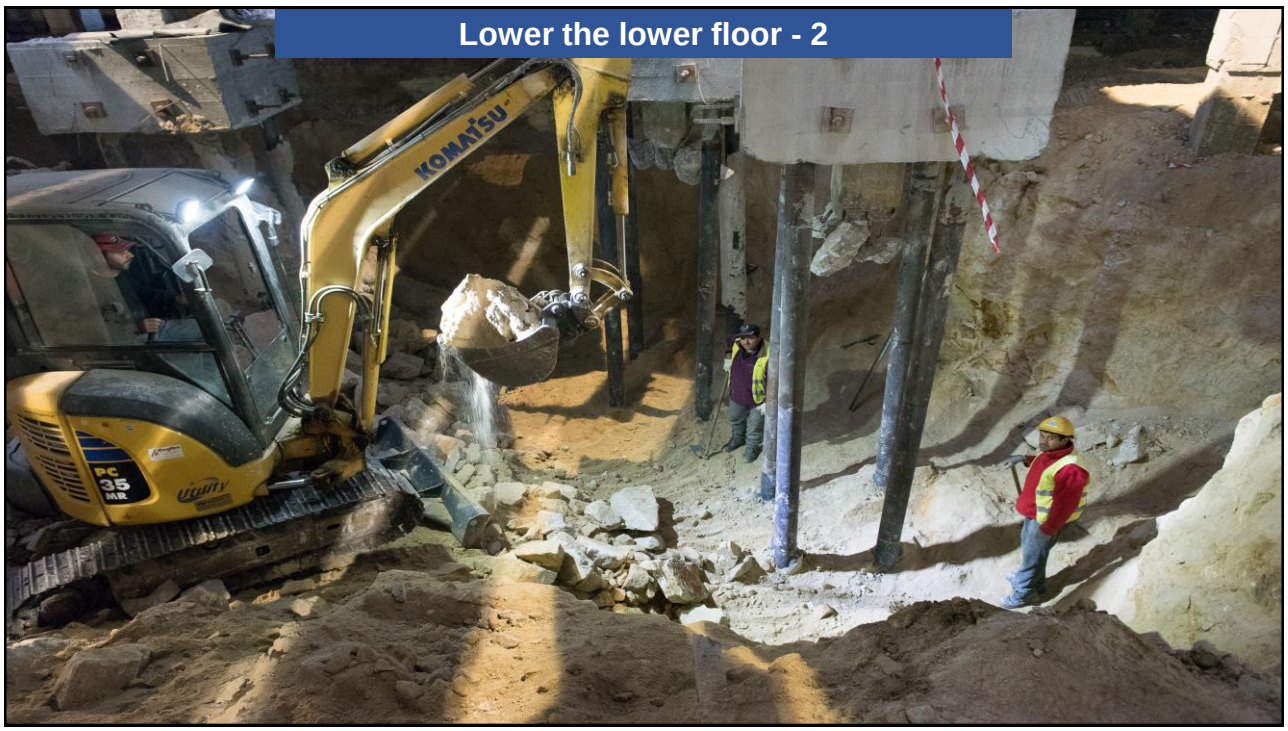
Lower the lower floor - 2



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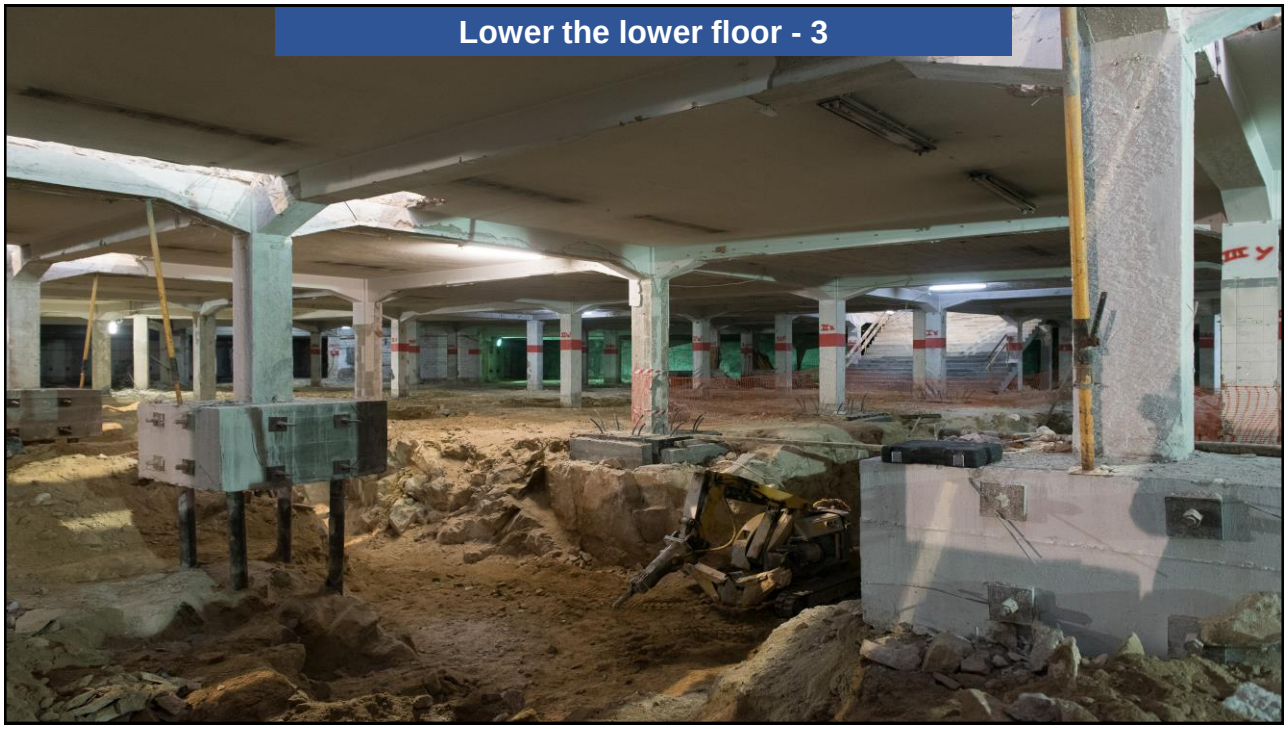
Lower the lower floor - 3



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Lower the lower floor - 4

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Engineering in large rehabilitation projects

Super Bock Arena - Rosa Mota Pavilion

A new lower floor was born…

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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING
CASE STUDY 4

(Hidden) Engineering in large rehabilitation/renovation projects

Arquitechture and Engineering in the Iconic century-old BOLHÃO Market

Coordination Prof. Arq. Nuno Valentim

Lúcios-Engenharia e Construção e ACA Engenharia &Construção

Teixeira Duarte – Engenharia e Construções S.A.

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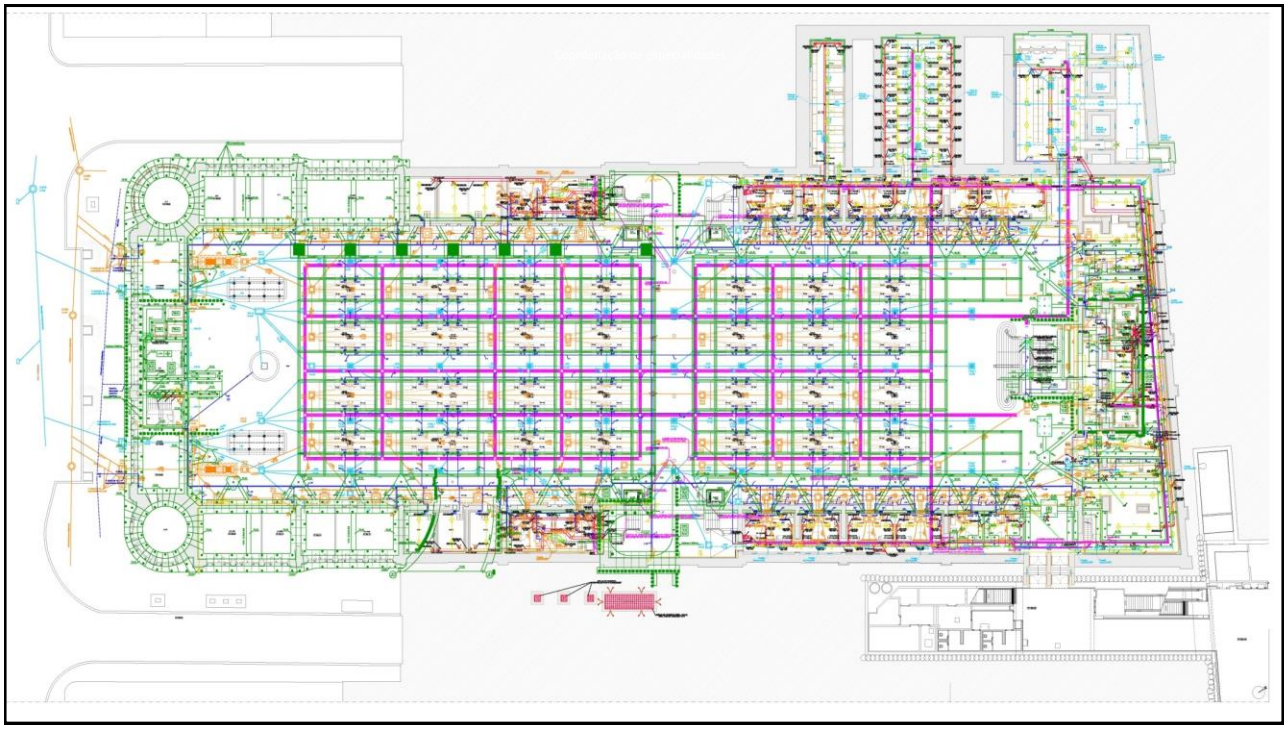

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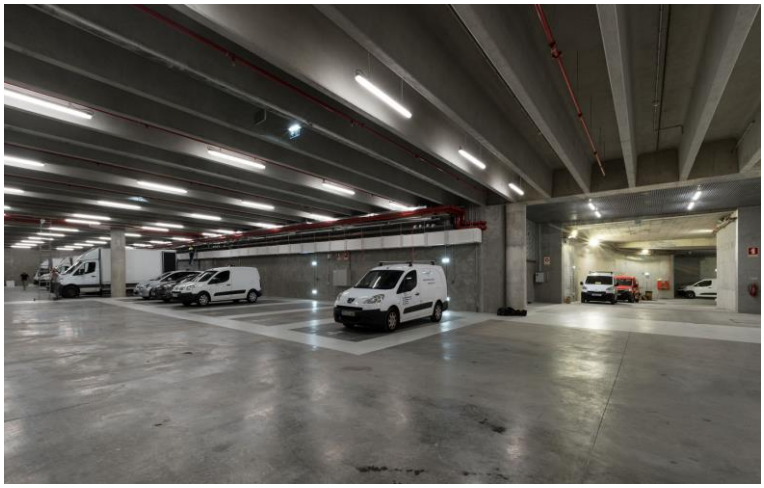
New lower floor for supply, logistics and technical support (cold storage and offices)



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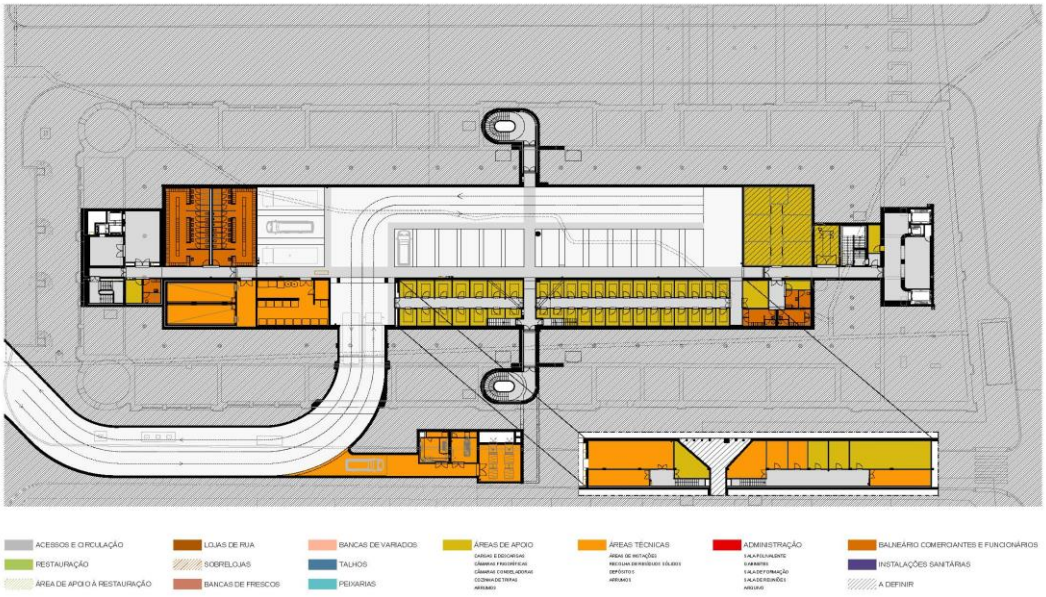
ACESSOS E CIRCULAÇÃO
RESTAURAÇÃO
ÁREA DE APOIO À RESTAURAÇÃO
LOJAS DE RUA
SOBRELOJAS
BANCAS DE FRESCOS
BANCAS DE VARIADOS
TALHOS
PEIXARIAS
ÁREAS DE APOIO
ÁREAS TÉCNICAS
ADMINISTRAÇÃO
BALNEÁRIO COMERCIANTES E FUNCIONÁRIOS
INSTALAÇÕES SANITÁRIAS
A DEFINIR

55


R. do
do Porto

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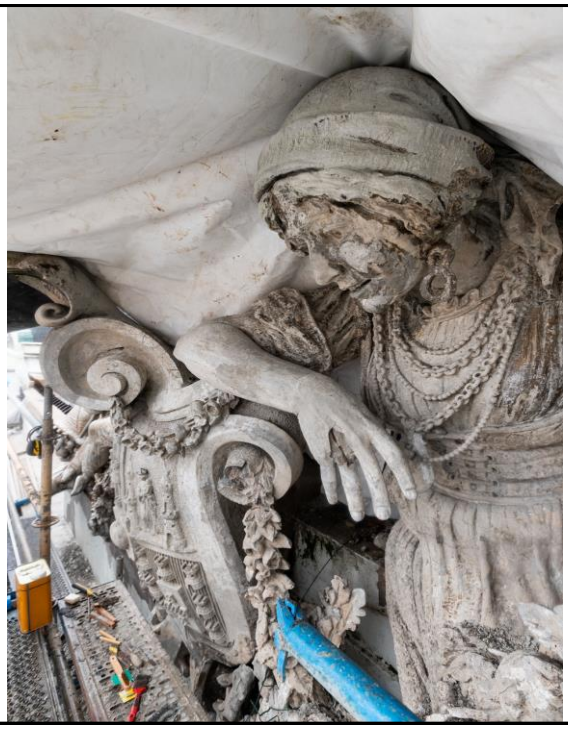

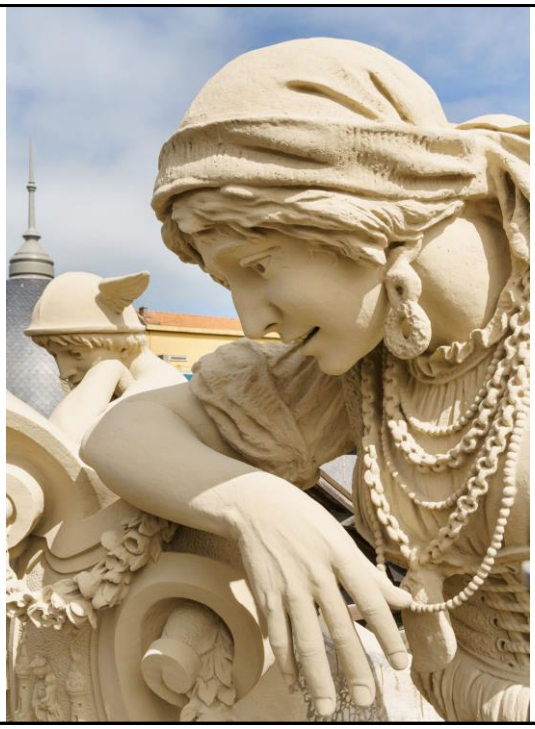

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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING CASE STUDY 5

Innovation and Entrepreneurship in Engineering

The Supercapacitors of C2C-NewCap

Founders – Eng. Rui Pedro Silva, Eng. André Mão de Ferro, Eng. Sónia Eugénio (IST)

- **Supercapacitors for mobility**
- **Significant reduction in truck operating costs and environmental costs**
  - ✓ **Savings on diesel consumption**
  - ✓ **Decrease in CO2 emissions**

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Spin-off from Universidade de Lisboa

C2C NEW CAP

Portugal

Head Office

2014

Founded by:
- Rui Pedro Silva
- André Mão de Ferro and
- Sónia Eugénio

Team

- 12 workers
- 3 PhDs
- 7 Engineers
- 2 Production Technicians

500 m²

- Pilot Plant
- Capacity nto produce 1000 cells / year

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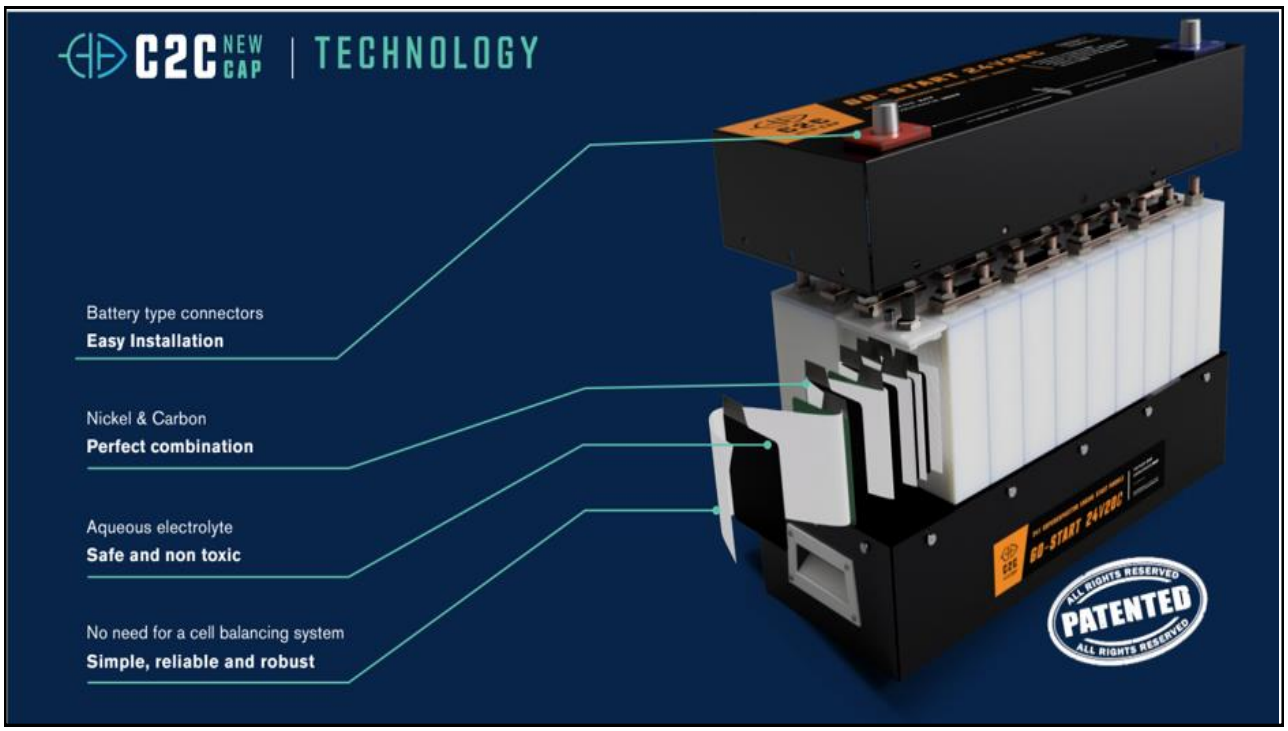
61



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Go-Start

- An SME focused on research, development and production of Supercapacitors.
- Develops fundamental research in the area of materials for Supercapacitors
- Develops business in the area of Supercapacitors
- At European level – an immense business opportunity ~ 6.2 M trucks in circulation
- In 2023 – 50 Units installed
- For 2024 - 100 new Units are planned

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Illustrating the potential of our Engineering Case study 6

Innovation and Entrepreneurship in Engineering

Omniflow – Solutions for Smart Cities

Founded by Eng. Pedro Ruão

- Founded in 2012
- Head Office in Porto, PORTUGAL
- Patented technology, designed and built in the EU
- Active in 35 markets worldwide

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Omniflow
Solutions for Smart Cities

- IoT smart light, powered by solar and wind energy
- Solution allows savings of over 90% in lighting
- … and also integrates other features such as security cameras, air quality sensors, 5G/wifi and electric vehicle chargers

65

66

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Omniflow
Solutions for Smart Cities

IMPLEMENTATION
+3000 Units
in 35 Countries

Team
21px

FINANCING
€4M

PATENTS
32 Granted
1 Pending

WEIGHT OF EXPORTS - ~70% OF BUSINESS VOLUME

T··· IKEA verizon orange SIEMENS vodafone ENGIE Telefónica amazon aramco

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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING
CASE STUDY 7

Innovation and Entrepreneurship in Engineering

I-Charging mobilidade elétrica s.a.

CEO Eng. Alberto Milheiro Barbosa

- They create technological products, reinforcing innovation, differentiation, design and quality, within the most sophisticated segments of infrastructure for electric mobility

69

70

A PIONEER EM DC FAST CHARGING

i-charging offers a comprehensive, leading product portfolio
with output powers of up to 1,600 kW
with relevant, internationally recognized, certifications

blueberry
50kW

blueberry
FUSION
150kW

blueberry
PLUS
50-600kW

blueberry
CLUSTER
50-600kW

blueberry
MAX
50-1,600kW

71

5 years
A successful journey

2019

- Join the Team
- Launching the blueberry project

2020

- Test Center
- Launching the blueberry family

2021

- CE blueberry certifications
- Starting production
- First deliveries
- Opening of USA offices
- First commissioning
- E-mobility Awards & German Design Award

2022

- New power unit 200 kW
- Eichrecht module B
- German Innovation Award
- New power unit 300 kW

2023

- Intertek ETL for EUA & Canada
- Launching blueberry FUSION
- Eichrecht module D
- Certification Plug & Charge

i-charging

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A GLOBAL SOLUTION

A global company with a blue-chip customer base and strong presence in key electric vehicle countries

30+ Countries

6 continents

3,150+ blueberries sold

500+ Total MW sold

50+ Customers & Partners

100+ FTE's

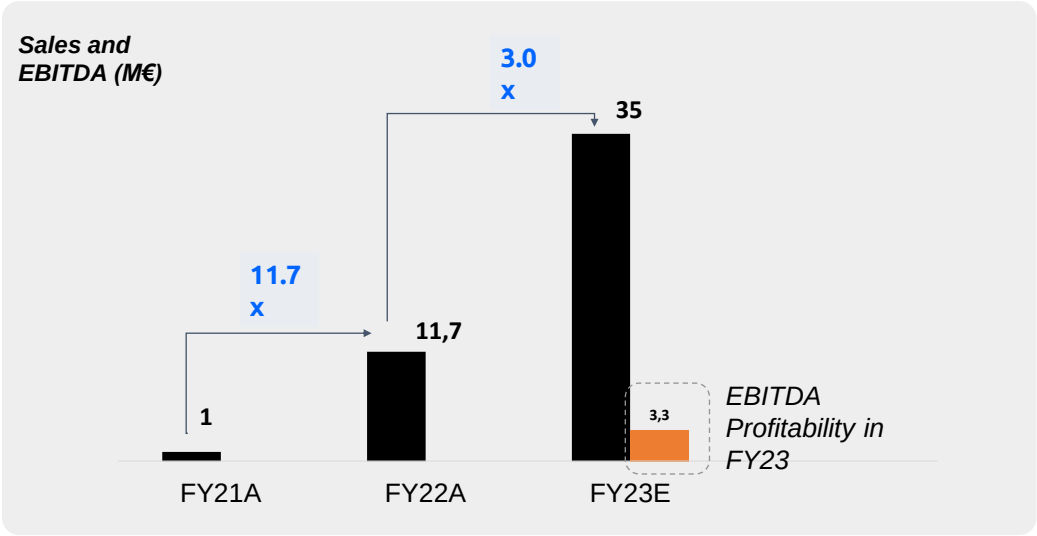
50+ FTE's in R&D and Engineering

Argentina
Australia
Brazil
Belgium
Dominican Republic
Egypt
France
Germany
Greece
Hungary
Koweit
India
Macau
Mexico
Morocco
Panama
Paraguay
Poland
Porto Rico
Portugal
Serbia
Slovenia
Spain
Thailand
Turkey
United Arab Emirates
United kingdom
Uruguay
USA

73

i-charging é a líder tecnológica, lucrativa e de crescimento mais rápido em carregamento rápido DC

i-charging has been on an impressive growth trajectory since the launch of the first Blueberry fast charger in 2021



74

i-charging

more at www.**i-charging.**pt

Some examples

Antuã, **Portugal**

Punta Cana, **Dominican Republic**

Wittenheim, **France**

Montelimar, **France**

Albacete, **Spain**

Szeged, Hungary

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i-charging

more at www.**i-charging.**pt

Some examples

AUDI, **UAE**

Bangkok, **Thailand**

Atlanta, GA, USA

Montabaur, Germany

S. Paulo, **Brazil**

Mont-de-Marsan, France

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i-charging

more at www.**i-charging**.pt

Some examples

Ostrzeszów, Poland

Panama City, Panama

Athens, Greece

Bourgoin Jallieu, France

UK

Mealhada, Portugal

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ILLUSTRATING THE POTENTIAL OF OUR ENGINEERING CASE STUDY 8

Innovation and Entrepreneurship in Engineering

SEAMORTECH

Founders Eng. Eva Sousa, Eng. Sofia Delgado (Spin Off - DEQ, FEUP)

- **Make the desalination of seawater through reverse osmosis more environmentally friendly and profitable**
  - **Harness valuable minerals**
  - **Increase freshwater recovery efficiency**
  - **Minimize the impact of toxic brine discharge**

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THE ISSUE OF WATER – ONE OF THE MAJOR STRATEGIC THEMES OF THE PRESENT

RISE NO SNS ENCHE URGÊNCIAS DE HOS

s particulares recebem doentes mais graves e já têm constr

No Algarve já não há água para salvar as laranjas

Escassez hídrica e seca obrigam a racionar abastecimento. Corte para a agricultura pode chegar a 70%

As albufeiras algarvias encontram-se a 25% da sua capacidade e os aquíferos subterrâneos também não estão em bom estado, devido à seca intensa que tem assolado a Região Sul do país há mais de dois anos. Para garantir água para abastecimento público até final de 2024, o Governo vai apresentar, na próxima quarta-feira, um novo plano de contingência para o Algarve, que passa por reduzir o abastecimento de água para a agricultura em 70% no Sotavento e em 15% para consumo humano; e por não licenciar novos furos. Em cima da mesa está também a proibição de novas áreas agrícolas de regadio na região. Os agricultores temem "uma catástrofe". P19

Water shortage

Cover page in major newspapers

12 January 2024

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A TEAM OF SIX, WITH TWO FOUNDERS VALUING RESOURCES FOR A SUSTAINABLE MARITIME ECONOMY

Cientistas portuguesas extraem minerais valiosos da salmoura que ninguém quer

P AZUL PLANETA CLIMA SUSTENTABILIDADE BIODIVERSIDADE POLUIÇÃO MULTIMÉDIA OPINIÃO SOBRE ABC DA TERRA MAIS

O projecto das cientistas nasceu nos laboratórios da Faculdade de Engenharia da Universidade do Porto (FEUP) e, há dois anos, deu origem a uma *spin-off* chamada SeaMoreTech. "Foi um desafio que nos foi lançado pelo professor Adélio Mendes", explica ao PÚBLICO Eva Sousa, referindo-se ao investigador da FEUP muito conhecido por apoiar a transição de novas tecnologias para o tecido industrial.

Eva Sousa e Sofia Delgado criaram a *spin off* SeaMoreTech PAULO PIMENTA

U.PORTO NOTÍCIAS UNIVERSIDADE DO PORTO

NOTÍCIAS AGENDA PESSOAS NÓS POR

PÁGINA INICIAL / NOTÍCIAS / CIÊNCIA E INOVAÇÃO

12.09.23 Por Raquel Pires / FEUP

Solução criada por investigadoras do LEPABE permite obter minerais imprescindíveis na indústria farmacêutica, automóvel e eletrónica.

Eva Sousa e Sofia Delgado conheceram-se quando desenvolviam trabalho no âmbito das respetivas teses de doutoramento no LEPABE / FOTO: DR

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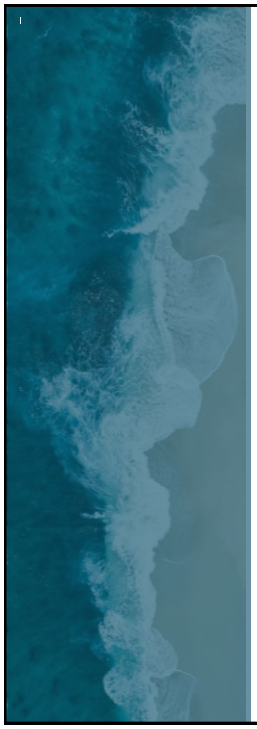

Address the environmental problem

Reverse osmosis is currently the most promising desalination technology to address water scarcity. But…

Unconscious discharge of brine into the oceans → Ecological disruption of the seawater food chain

142 million m3 of toxic brine daily

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Opportunity

Valorization of brine minerals – why?

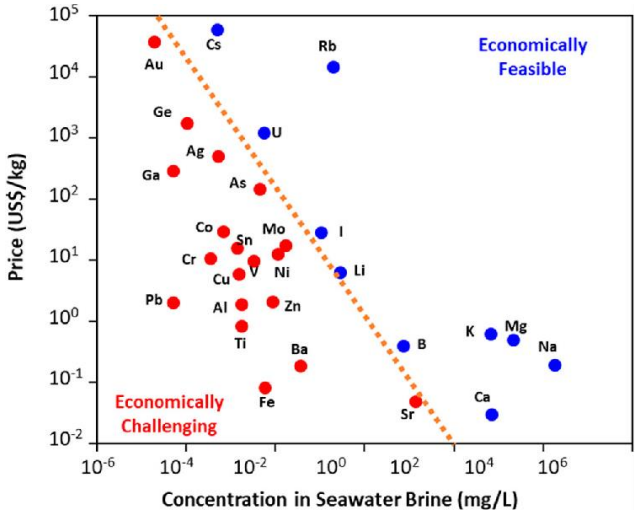
Concentration of minerals duplicates in brines resulting from inverse osmosis

Minerais that serve various industries

(Pharmaceutical, Automotive, Eletronics…)

Market currently very dependent on non-European industries

Critical raw materials in the EU



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The Solution
Valuing resources for a sustainable maritime economy

A 2-Step Production Process

Project's final goal
Treat up to 600 m3 of toxic brine per hour

For 2024

Pilot scale experiment

Semi-industrial application contracted in an Industrial Desalination Plant (private) in the Algarve, with the expected treatment of 30 m3/day of brine

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Epílogue

Is World Development in the Hands of Engineering?

- Naturally, it is also in the hands of other areas, **but it is VERY MUCH in the hands of Engineering, of Engineers…**
- Portugal has a large, high quality installed Engineering capacity, in Engineers and in Companies, **with AMBITION… looking to the outside World…**
- It is fundamental for our collective future that our Governments **ENHANCE, BOOST, SUPPORT,** the intervention of Engineering, recognizing and using its ability **to DO –**

Bring Engineering to cooperate more in the design of policies

Give Engineering the responsibility to

make and implement these policies on the field

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ORDEM DOS ENGENHEIROS
WORLD ENGINEERING DAY FOR SUSTAINABLE DEVELOPMENT
WFEO / FMOI
In support of UNESCO World Engineering Day
unesco
Com o Alto Patrocínio de Sua Excelência
Under the High Patronage of the President of the Portuguese Republic
O Presidente da República
Many thanks for your attention
Said
Engineering Solutions for a Sustainable World
Lisbon, March 4th 2024

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