



**Fravizel**  
engineering

# **New Technological Approach *Made in Portugal***

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May 6<sup>th</sup> , 2016

# The Stone Sector in Portugal: before

- Mainly sale of blocks (unprocessed stone);
- Large factories: tiles in series or Small factories: craftman workshops;
- The respect for the environment was minimal;
- Low productivity and high production costs;
- Low safety for workers.
- Almost all equipment were imported;



vs



# The Stone Sector in Portugal: Now

- More productions flexibility;
- There was an increase in the value chain of products offered;
- Stronger image of stone made in “Portugal”;
- High exportation level;
- The most advanced and innovative companies producing products in natural stone, in the world.

**WHY???**

# The Stone Sector in Portugal: Now

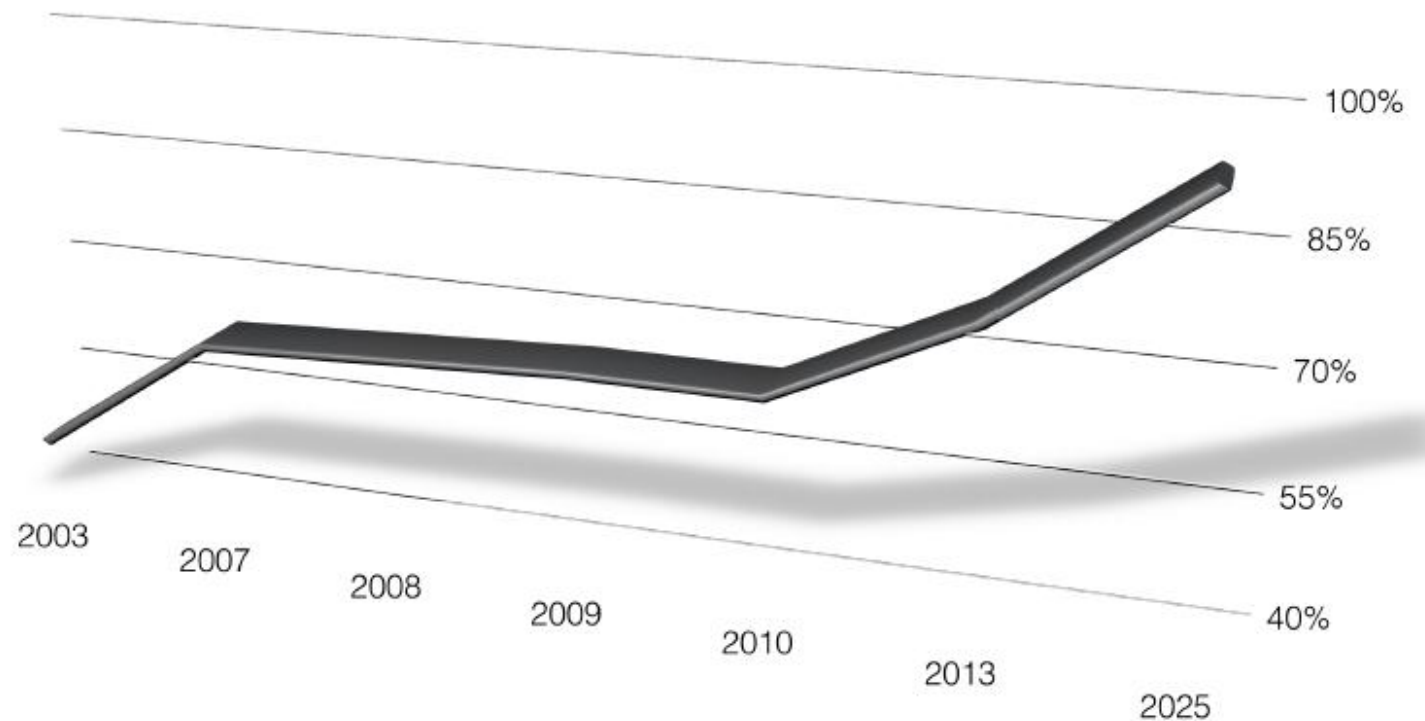
## BECAUSE!!!!

- Portugal has companies that manufacture INNOVATIVE equipment for extraction and processing of Natural Stone;
- Today Portugal exports the world's most innovative equipment to more than 30 countries.

# The Stone Sector in Portugal

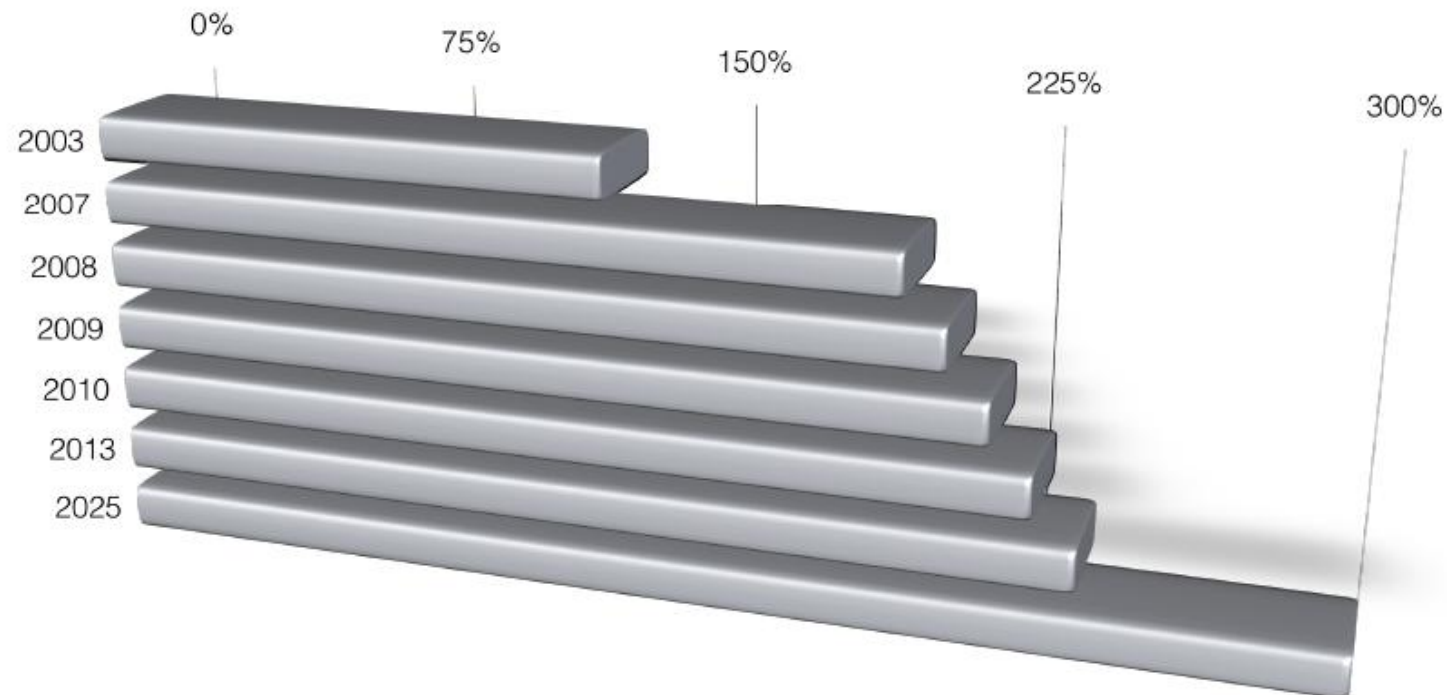
- Raw material is extracted and processed in Portugal;
- Machinery bought in Portugal;
- Labor work from Portugal

## Gross Value Added Evolution

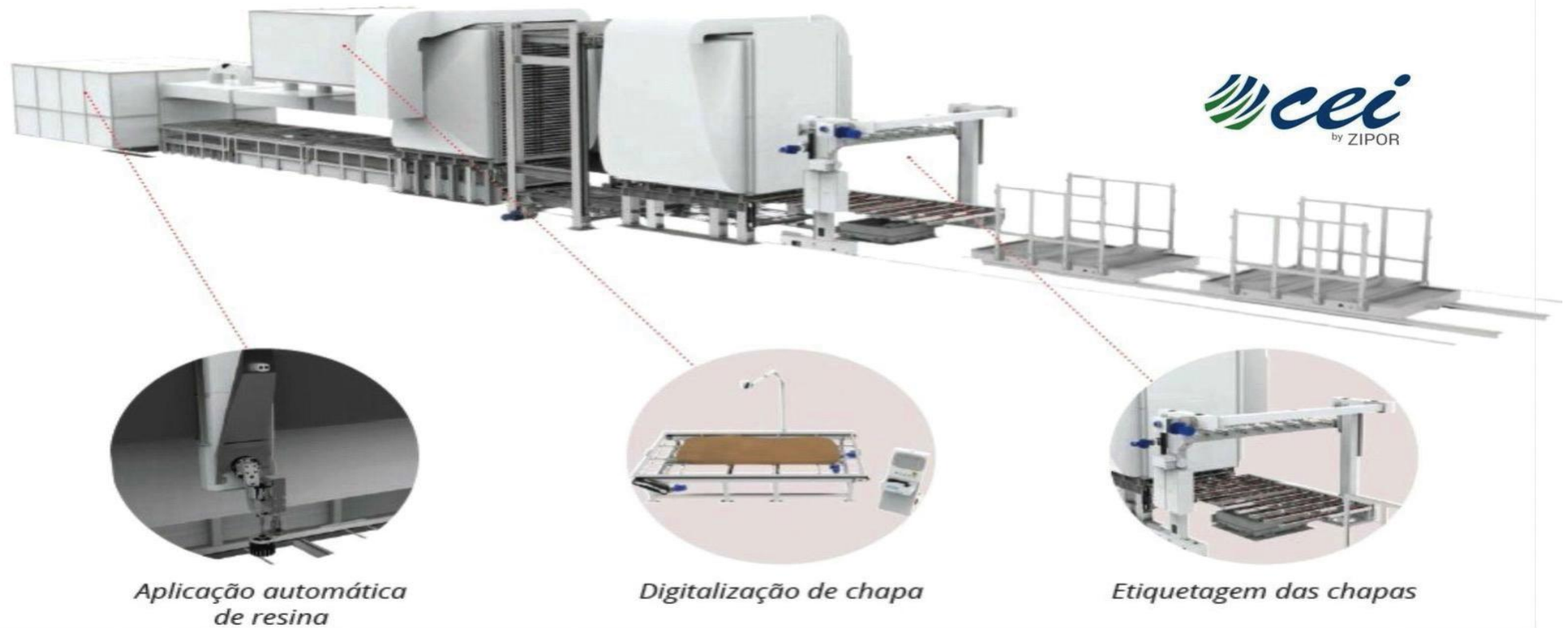


# The Stone Sector in Portugal

## Value added to the raw material



## The Stone Sector in Portugal: Innovation on valorization of natural stone

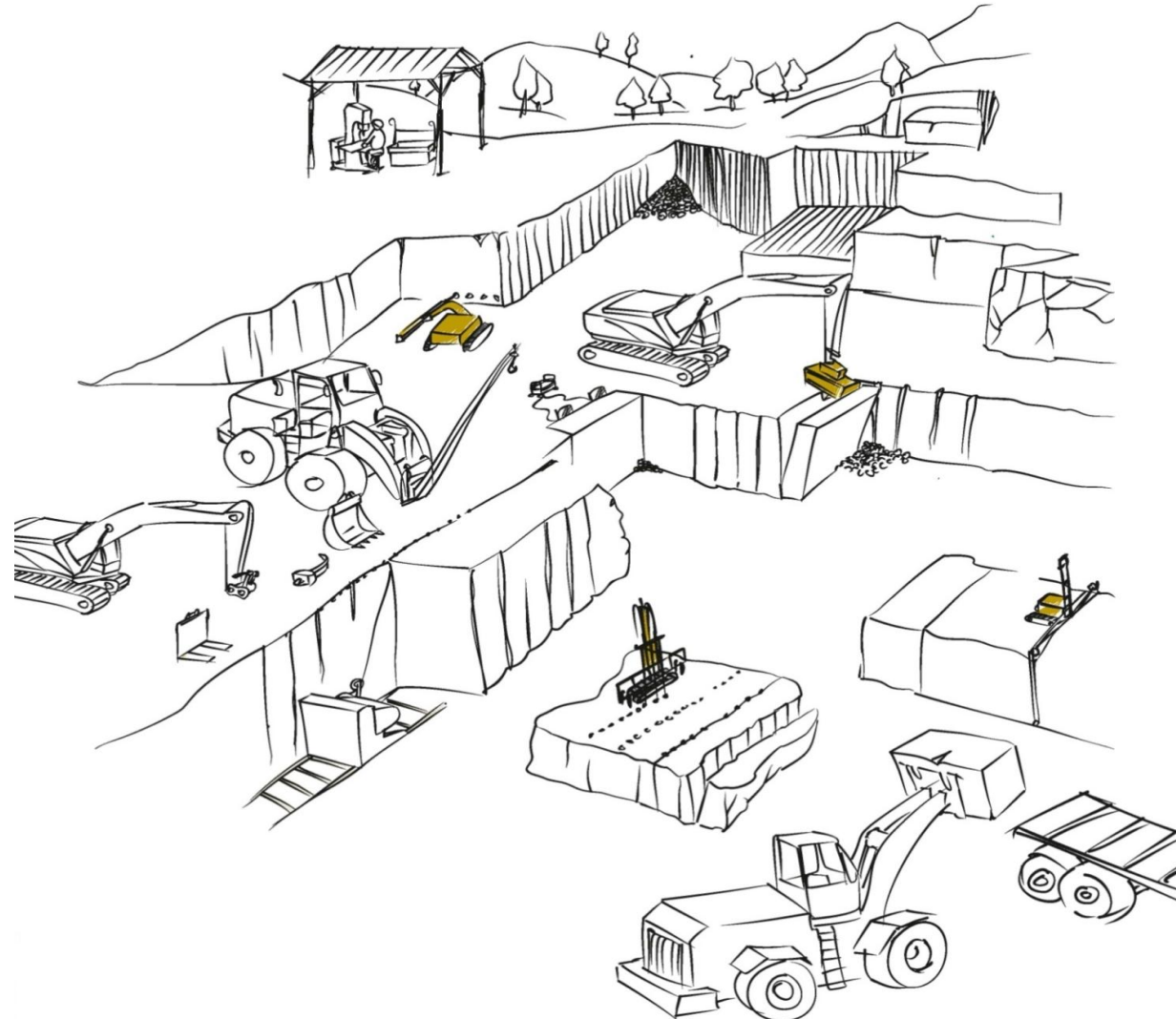


# The Stone Sector in Portugal: Innovation on historical heritage Recovering

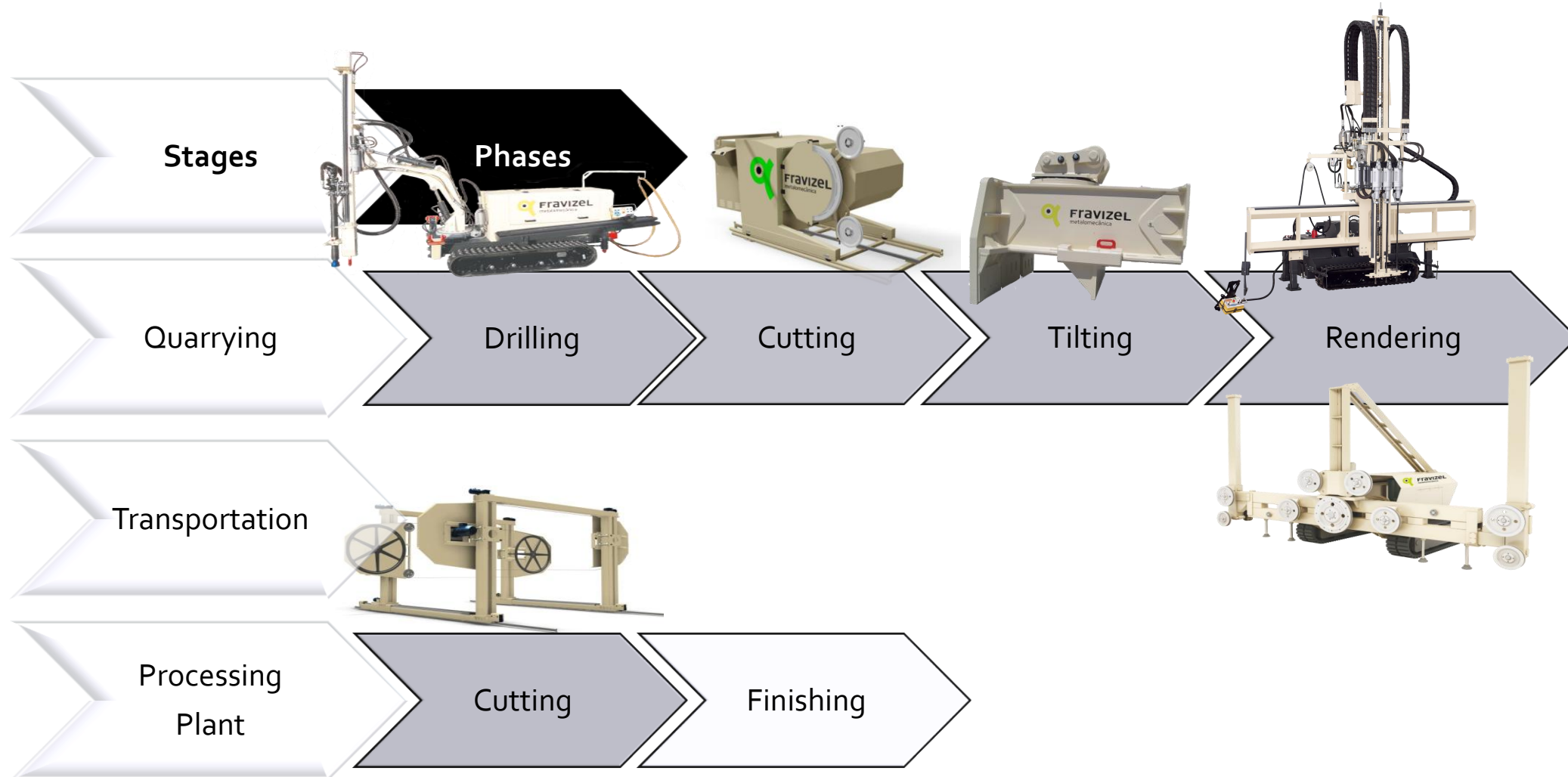


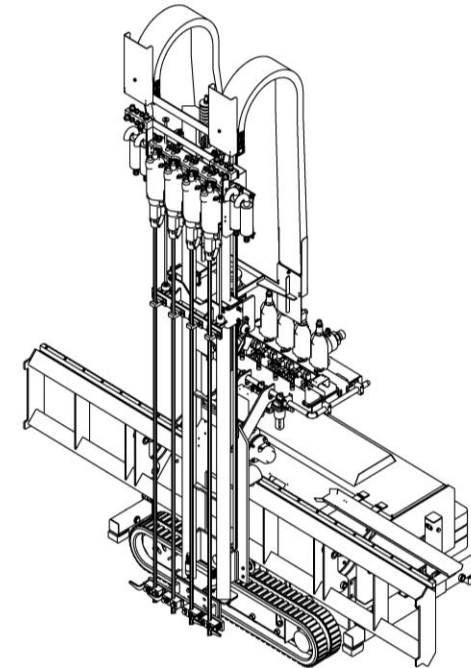
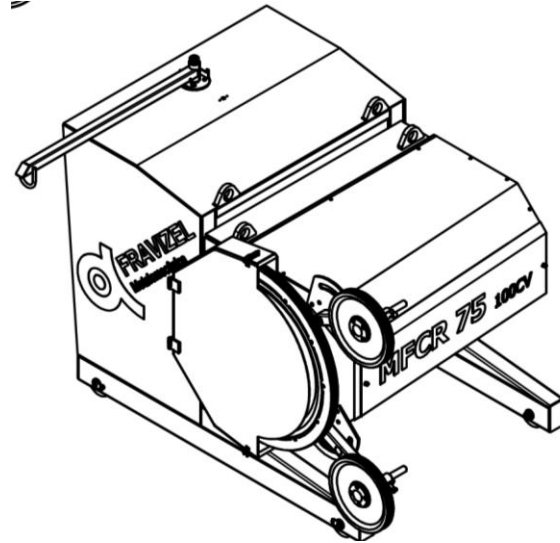
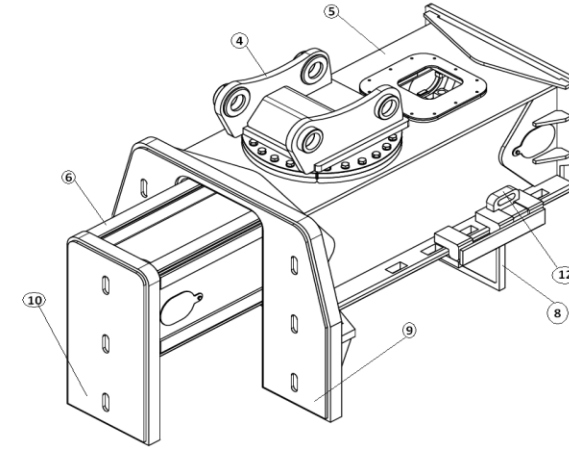
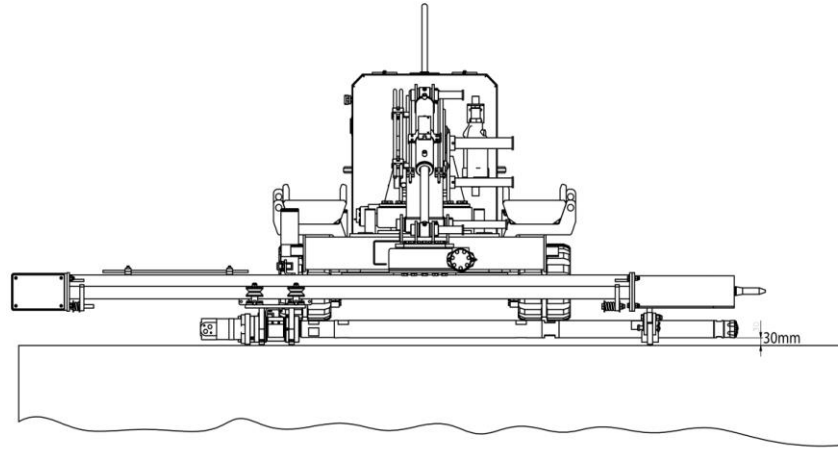


## The Stone Sector in Portugal: Innovation on extraction of natural stone



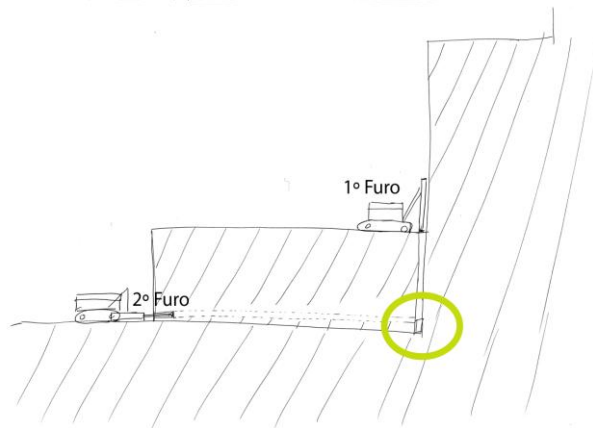
# New Technological Approach





# Down The Hole Machine

Is a Drilling Down the Hole Machine  
machine to the triangulation process  
(first stage in the quarry)



			Substitute Down the Hole Machine	Tracked Down the Hole Machine
Diameter Hole		Mm	90	90
Average length in drilling	MCP	M	3,74	11
Average assembly time	TMM	Min	600 (2 pax)	15 (1 pax)
Total number of evaluated holes	TF		8	17
Drilling Velocity	Vp	m/h	3,35	4,28
10m hole Calculation				
Average assembly time	TMM	Min	600 (2 pax)	15 (1 pax)
Drilling Velocity	Vp	m/h	3,35	4,28
Hole depth	PF	M	10	10
Total time	TMM + PF / vp	Min	602,99	57,8
<b>Added Productivity</b>			<b>90,41%</b>	

Results don't take in consideration other factors that directly influence the productivity.

# Added Value

- **Added productivity of 91%**
- Time reduction for movement and putting working. This leads to a reduction in time between holes;
- Self propelled, do not depend on other machines to position;
- Hydraulic leveling that allows you to adjust the start of drilling more quickly;
- Reduces hole height from the floor, which increases the amount of explored stone, reducing the gap between floors (levels) that maximizes the following operations;
- Drilling course 2000mm (alternative are mostly 1000mm).

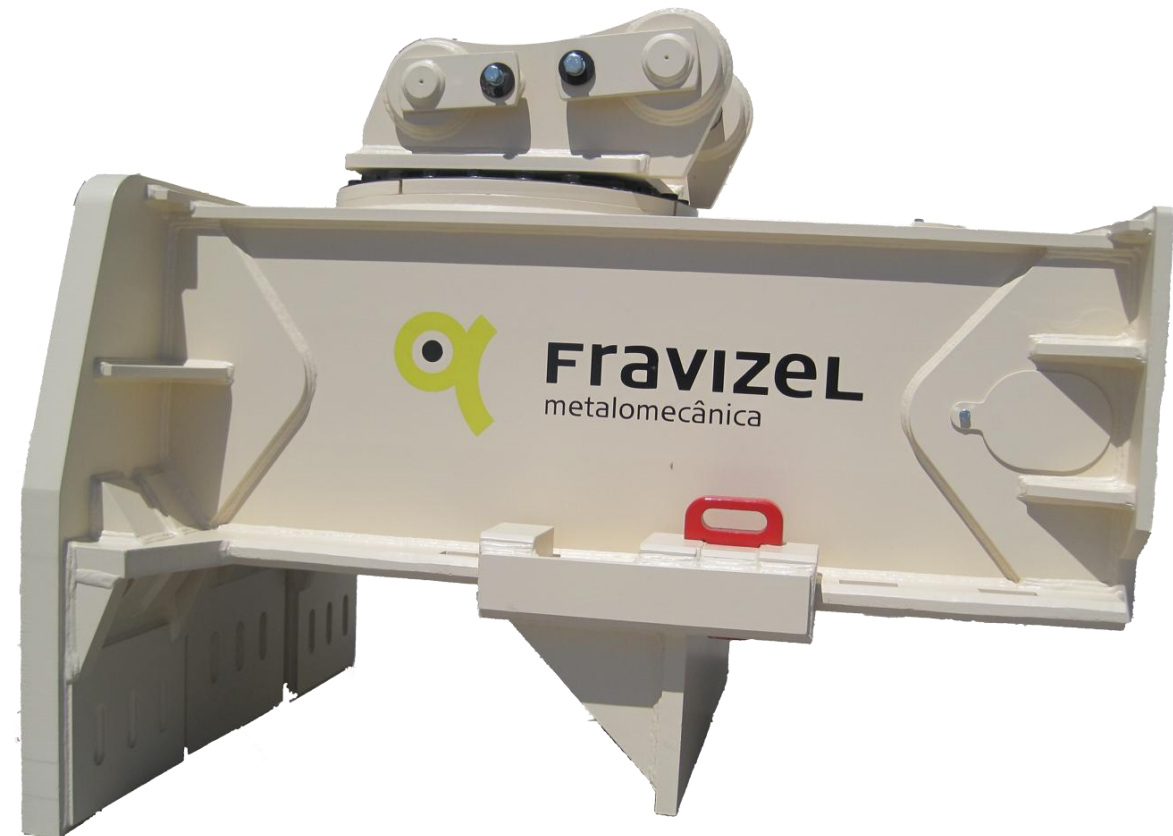


## Hydraulic stone bench pusher

Is a high power stone mass displacement system .

Attachment for excavator/loader.

Tilting up to 2000 tones of stone, depending on the bench size







We want to avoid this!



	Substitutes			Hydraulic Stone Block Pusher		
	Method	Resources		Method	Resources	
		Type	Time		Type	Time
Height H (m)	8					
Width W (m)	12					
Depth D (m)	2,4					
Density DY (t/m <sup>3</sup> )	2,4					
Produced Quantity PQ (t) = H*W*D*DY	553					
Preparation Time TS (min)	Preparation of air bags, equipping excavators with accessories	Human resources and excavator type machine	60	Preparation of air bags, equipping excavator with hydraulic stone block pusher	Human resources and excavator	20
Operating real time TR (min)	Displacement or initial tilting with air bags, and final tilting with excavators	2 or more excavators and 3 operators	180	Displacement or initial tilting with air bags. Final tilting with excavator	1 excavators and 1 operator	12 8
Operational Performance PO (t/h)= QP/((TS+TR)/60))	138,2			829,4		
<b>Added Productivity</b>	<b>83%</b>					

Results don't take in consideration other factors that directly influence the productivity.

# Added Value

- Added productivity of 83%;
- Allows a machine of 30/40 tons to substitute a 80 tons machine.
- Less attachments;
- Operating safety;
- Less human and equipment resources;
- More energetic efficient because you use a smaller machine (less fuel emissions, less CO<sup>2</sup>).



# Added Value

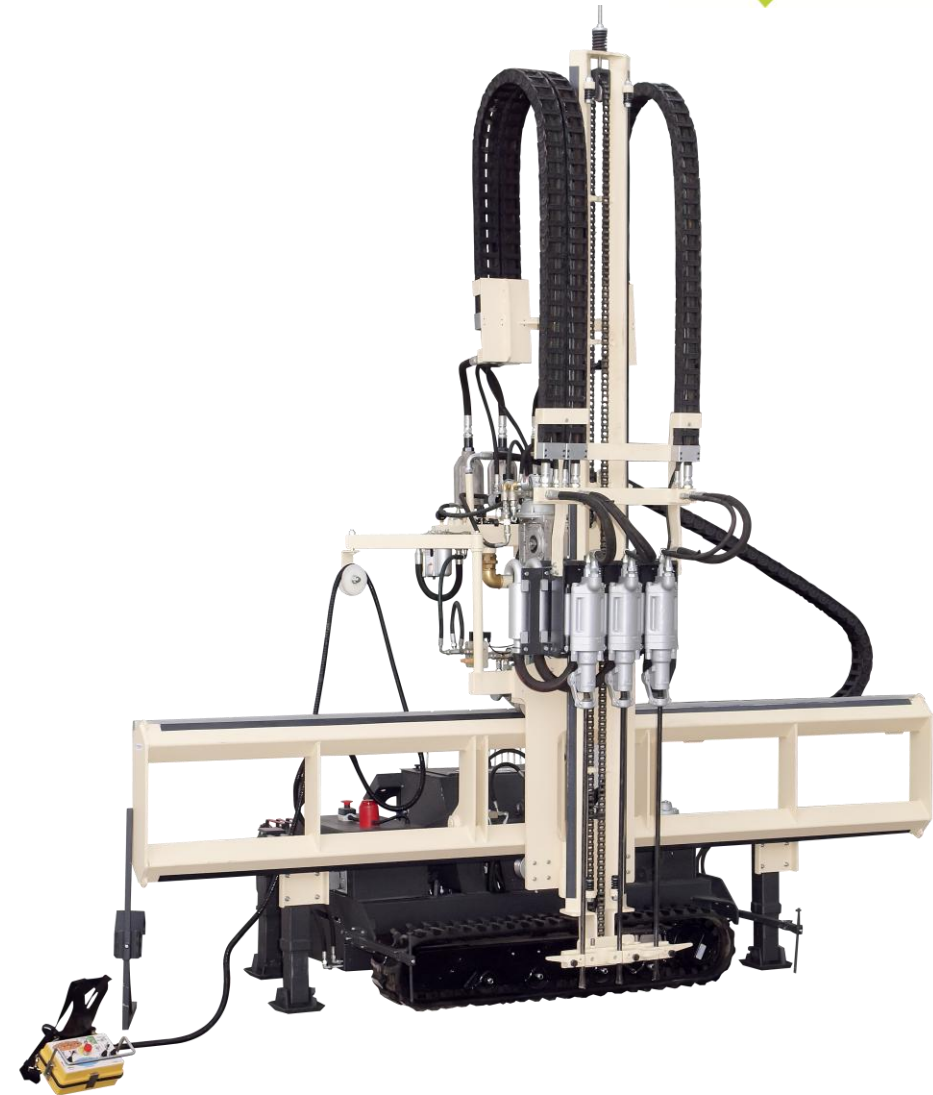
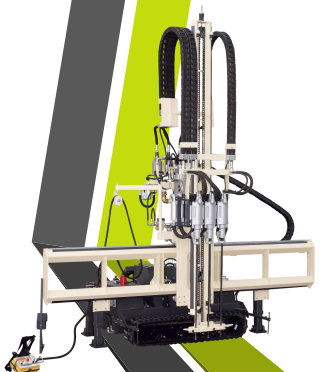
“Hydraulic Bench Pusher is the biggest innovation in the Industry in the last 20 years.”

Engineer Manuel Simões (Assimagra President)



## Tracked Drilling Machine

Transformation of the  
stone mass in  
transportable blocks.







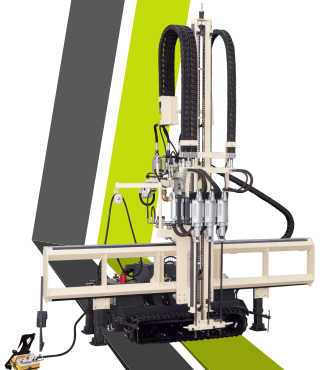
			Pneumatic Drilling Machine	Hydraulic Drilling Machine	Tracked Electric Drilling Machine 4xMP100
Drilling depth	DD	m	1.9		
Drilling length	DL	m	12		
Spacing between holes	SH	m	0,15		
Total number of holes	TH=DL/SH		80		
Number of hammers	NM		2	2	4
Total vertical cycles	TVC		40	40	20
Vertical Speed	VS	m/min	0.18	0.18	0.18
Lateral Speed	LS	m/min	0.14	0.14	0.14
Drilling Speed	DS	m/min	0.8	1.3	0.86
Time for repositioning and change bits	TR	min	23	12	6
Number of repositionings	NR		3	3	3
Drilling time	DT=DD*DS*TVC	min	95	58	44
Time between drillings (up and lateral movement)	TD= TVC*(DD*VS+SH*LS)	min	14.52	14.52	7.26
Total time for the drilling of the stone mass (12 meters)	TT= DT+TD+TR*NR	min	TT1	TT2	TT3
			179	109	69
<b>Added productivity</b>			<b>61%</b>	<b>36%</b>	<b>-</b>

Results don't take in consideration other factors that directly influence the productivity.

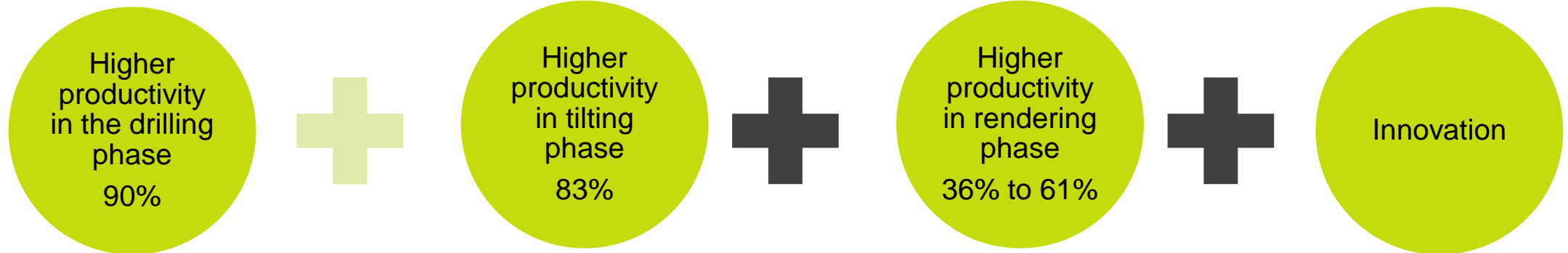


# Added Value

- **Added productivity of 36 between 61 %;**
- Autonomous, no need for operator in automatic drilling mode;
- Mobility;
- More safety, less human contact with the machine.



# Impacts on the natural sector



# Impacts on the natural sector



## Impacts on the natural sector

**“Fravizel belongs to a Natural Park so it has to be twice preventive. Today is possible to have extraction in natural park with our technology.”**

**“This innovative technology equip the Europe's quarry with higher productivity per employee. It works with 3 people and has an average productivity of 1100 m<sup>3</sup> per month.”**



**End**  
Thank you