

**INSTALLATION OF  
MICROPILES FOR THE  
FOUNDATION OF THE NEW  
FURNACE AT THE O-I  
PELDAR ZIPAQUIRA PLANT.**

INGENIERO  
**ESTEBAN DE LA CRUZ SOTO**



**COLOMBIA S.A.S.**

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# SCHEDULE

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BACKGROUND

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LOCAL AND REGIONAL GEOLOGY

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WORK FRONT

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DEVELOPMENT OF THE WORK DETAILS.

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RESULTS



# BACKGROUND [1/3]

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Owens-Illinois Inc. is a specialized company in the glass containers production.

It is one of the main glass containers, packaging manufacturers , with predominant position in North America, South, Asia-Pacific Europe.

# BACKGROUND [2/3]

## TRASLADO DE LA PLANTA DE ENVIGADO ANTIOQUIA A ZIPAQUIRA CUNDINAMARCA

More than 70 years in the Peldar, Envigado-Antioquia plant.

94 people in administrative area

The 70 % of them asked to be relocated in the new Zipaquirá-Cundinamarca, plant.



265 people in manufacturing area.

94 people in services center.

The plant located in Zipaquirá has over 200 hectares for new furnace construction.



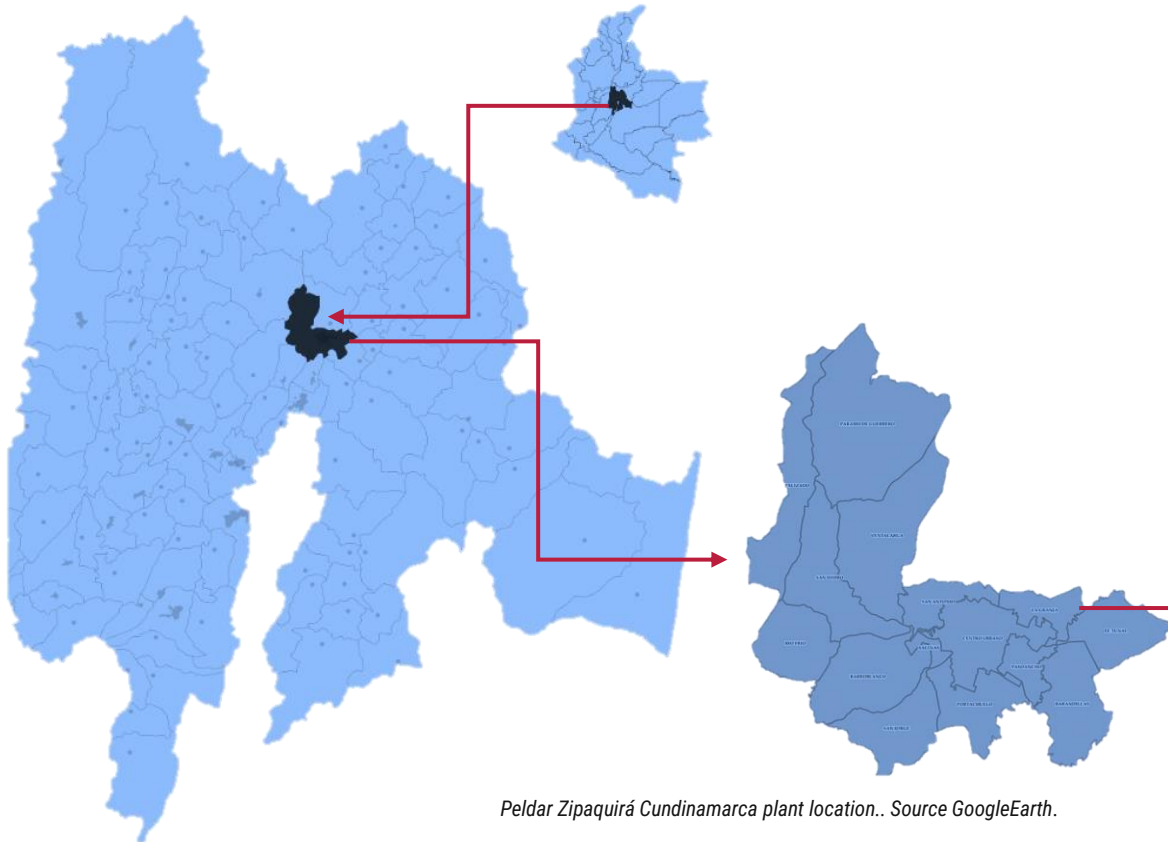
Planta de Peldar en Envigado Antioquia.. FOTO **EDWIN BUSTAMANTE PERIÓDICO EL COLOMBIANO**.



Planta de Peldar en Zipaquirá Cundinamarca.. Fuente Organización Ardila Lülle <https://www.oal.com.co/empresas/o-i-peldar>

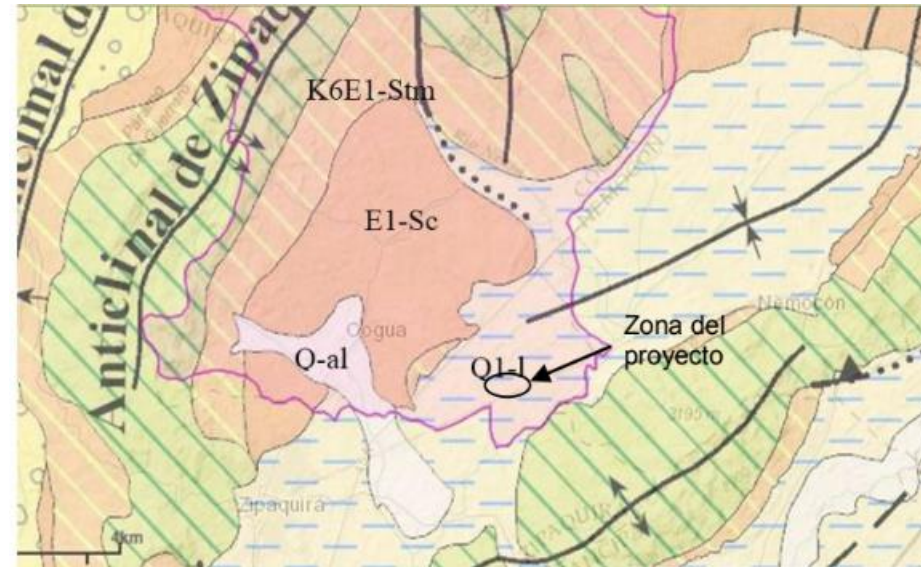
# BACKGROUND [3/3]

## LOCATION



*Peldar Zipaquirá Cundinamarca plant location.. Source GoogleEarth.*

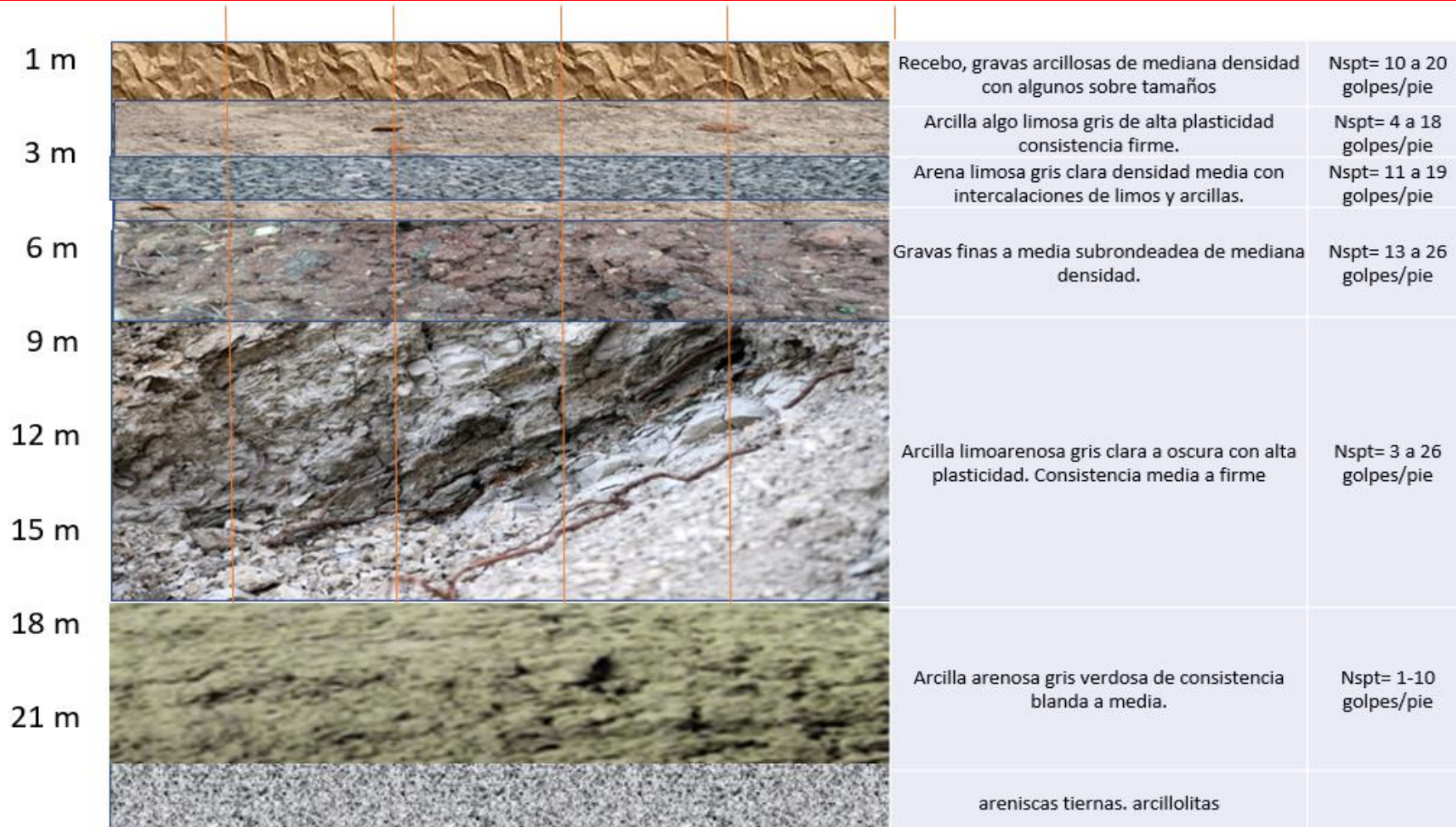
# LOCAL AND REGIONAL GEOLOGY [1/2]



regional geology in zipaquirá cundinamarca located in the Project zone. Source "estudio de suelos y diseño de la estructura de pavimento para la fase de ingeniería de detalle, proyecto de construcción de la primera etapa de planta de oxígeno de peldar ubicado en el municipio de cogua, cundinamarca"

The geology in the area of the plant is comprised of Quaternary deposits consisting of silty clays, peat, and sandy clays with small particles of gravels, sands eroded from the soft sandstone formations and labor, and layers of diatomaceous deposits belonging mainly to the Q1-I formation.

# LOCAL AND REGIONAL GEOLOGY [2/2]



# WORK FRONTS<sub>[1/2]</sub>

## 1. MACHINES

MICROPILES	LENGTH (m)	NUMBER OF MICROPILES	TOTAL LENGTH (m)
73/53	18,5	46	851
73/53	21	56	1176
52/26	21	8	168
TOTAL			2195

## 2. OXYGEN PLANT

MICROPILES	LENGTH (m)	NUMBER OF MICROPILES	TOTAL LENGTH (m)
INCLUSIONS	6	71	426
INCLUSIONS	9	28	252
73/45	9	44	396
73/45	21	24	504
LOAD TEST MICROPILES 73/45	21	3	63
TOTAL			1641

## 3. SMELTER

MICROPILES	LENGTH (m)	NUMBER OF MICROPILES	TOTAL LENGTH (m)
73/53	21	8	168
73/53	12	4	48
TOTAL			216

## 4. POWER HOUSE

MICROPILES	LENGTH (m)	NUMBER OF MICROPILES	TOTAL LENGTH (m)
73/45	21	48	1008
73/45	18	10	180
TOTAL			1188

## 5. COMPRESSORS

MICROPILES	LENGTH (m)	NUMBER OF MICROPILES	TOTAL LENGTH (m)
103/78	24	36	864
TOTAL			864

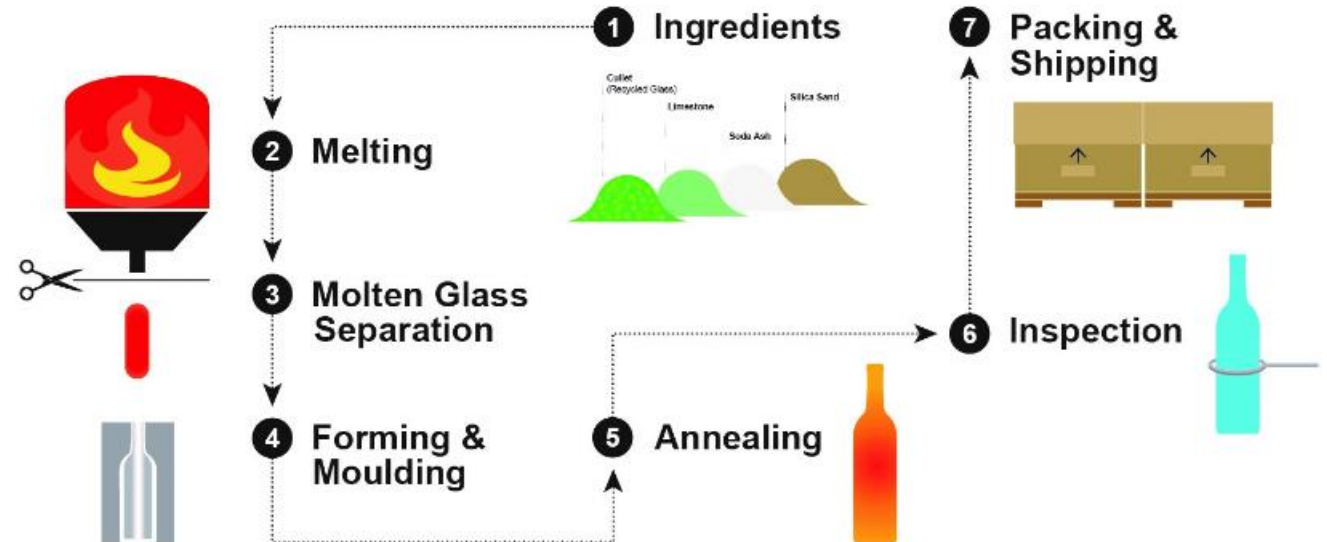
## 6. CULLET SYSTEM

MICROPILES	LENGTH (m)	NUMBER OF MICROPILES	TOTAL LENGTH (m)
103/78	18	66	1188
73/45	15	32	480
LOAD TEST MICROPILES 103/78	18	3	54
TOTAL			1722



# FRENTES DE TRABAJO [2/2]

TOTAL METERS OF INSTALLED MICROPILES	
ZONE	TOTAL LENGTH (m)
MACHINES	2195
OXYGEN PLANT	1641
SMELTER	216
POWER HOUSE	1188
COMPRESSORS	864
CULLET SYSTEM	1722
<b>TOTAL</b>	<b>7826</b>

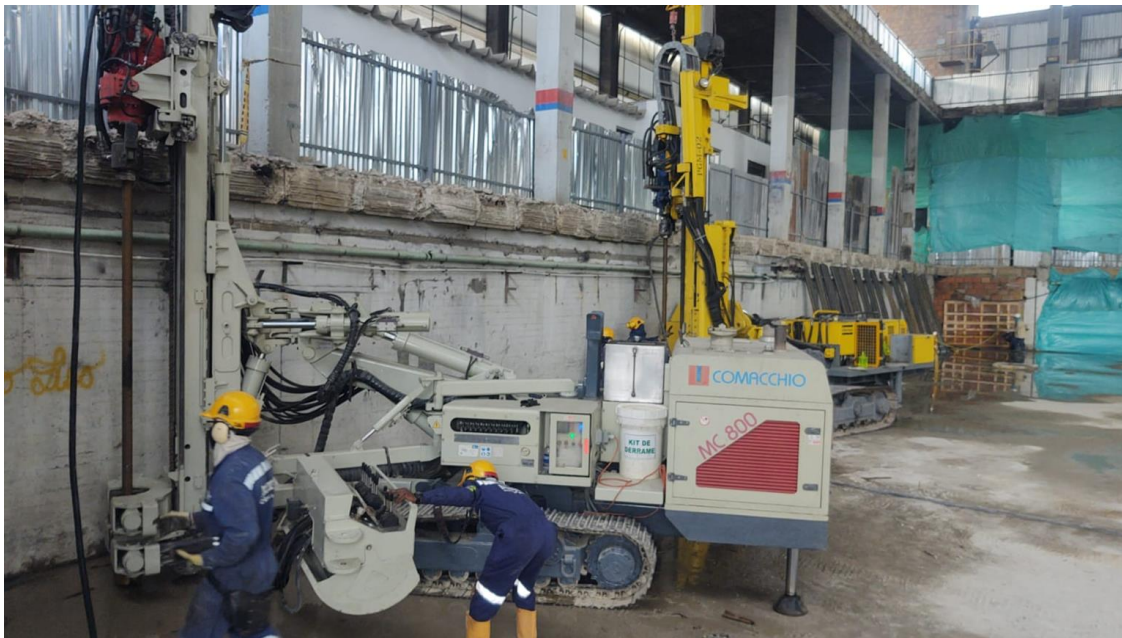


Proceso de fabricación de botellas en planta de O-I Peldar fuente <https://www.o-i.com/es/our-story/como-se-hacen-las-botellas-y-frascos-de-vidrio/>

# PROJECT DEVELOPMENT DETAILS.[1/7]

Some of the characteristics of the Peldar project development for ISCHEBECK COLOMBIA S.A.S are as follows:

1. Repowering for the machine area of the new furnace through 110 TITAN 73/53 and 52/26 type micropiles with an average depth of 21m.



# PROJECT DEVELOPMENT DETAILS.[2/7]

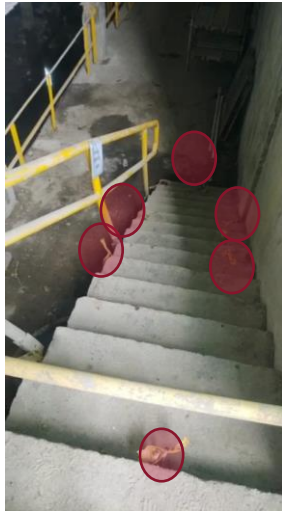
2. Soil improvement through 71 rigid inclusions of 6m depth for the oxygen plant structure, installation of 4 TITAN 73/45 type micropiles of 9 meters with improvement of the surrounding soil through 28 rigid inclusions of 9m, to foundation a 14m height tank; installation of 44 TITAN 73/45 type micropiles and installation of 24 TITAN 73/45 type micropiles for tank foundation..



# PROJECT DEVELOPMENT DETAILS.[3/7]

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3. Repowering of the furnace stairs through the installation of 8 TITAN 73/45 type micropiles of 21 meters and 4 of 12 meters..



# PROJECT DEVELOPMENT DETAILS.[4/7]

4. Installation of 48 TITAN 73/45 type micropiles of 21 meters and 18 of 18 meters for the foundation of substations and machinery for the powerhouse..



# PROJECT DEVELOPMENT DETAILS.[5/7]

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5. Installation of 36 TITAN 103/78 micropiles, 24 meters deep, for the foundation of the feed compressors..



# PROJECT DEVELOPMENT DETAILS.[6/7]

6. Installation of 66 TITAN 103/78 type micropiles of 18 meters and 32 TITAN 73/45 type micropiles of 15 meters for the foundation of the Cullet System structure..



# PROJECT DEVELOPMENT DETAILS.[7/7]

Use of two crews composed of a total of 7 personnel, including two drilling equipment operators, two injection equipment and procedure supervisors, three assistants, a safety inspector, and an ISCHEBECK COLOMBIA S.A.S project manager and resident.

Implementation of Hydraulic drilling equipment consisting of a Mustang drilling machine equipped with a KRUPP HB50A ROTO-PERCUTOR hammer and a Comacchio drilling machine equipped with a EURODRILL 5012 ROTO-PERCUTOR hammer.

Utilization of injection equipment including Obermann and Ischebeck pumps. The project's start, equipment arrangement, and positioning at the drilling front are reflected in the following image, which shows the type of equipment used and the working conditions under which the drilling and injection for the Micropiles had to be carried out.





# ENGINEERING CHALLENGES<sub>[1/4]</sub>

Minimum diameters of 30 cm are required in all perforations in highly plastic clay soils..

At least one meter must be drilled in sandstone..

Micropiles must be drilled with diameters greater than 50 cm for the first 3 m of depth, and baskets must be installed to prevent buckling due to the high structure.



Modification of the drill bits to meet the required diameters according to the soil expansion factor and the outgoing flow pressure of the nozzles..



The machines must be capable of drilling without significant rejection against the rock at depths greater than 20 m.



The drill bit must be modified with fins to meet this need..

# ENGINEERING CHALLENGES<sub>[2/4]</sub>

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## TRACTION AND COMPRESSION LOAD TEST

OXYGEN PLANT



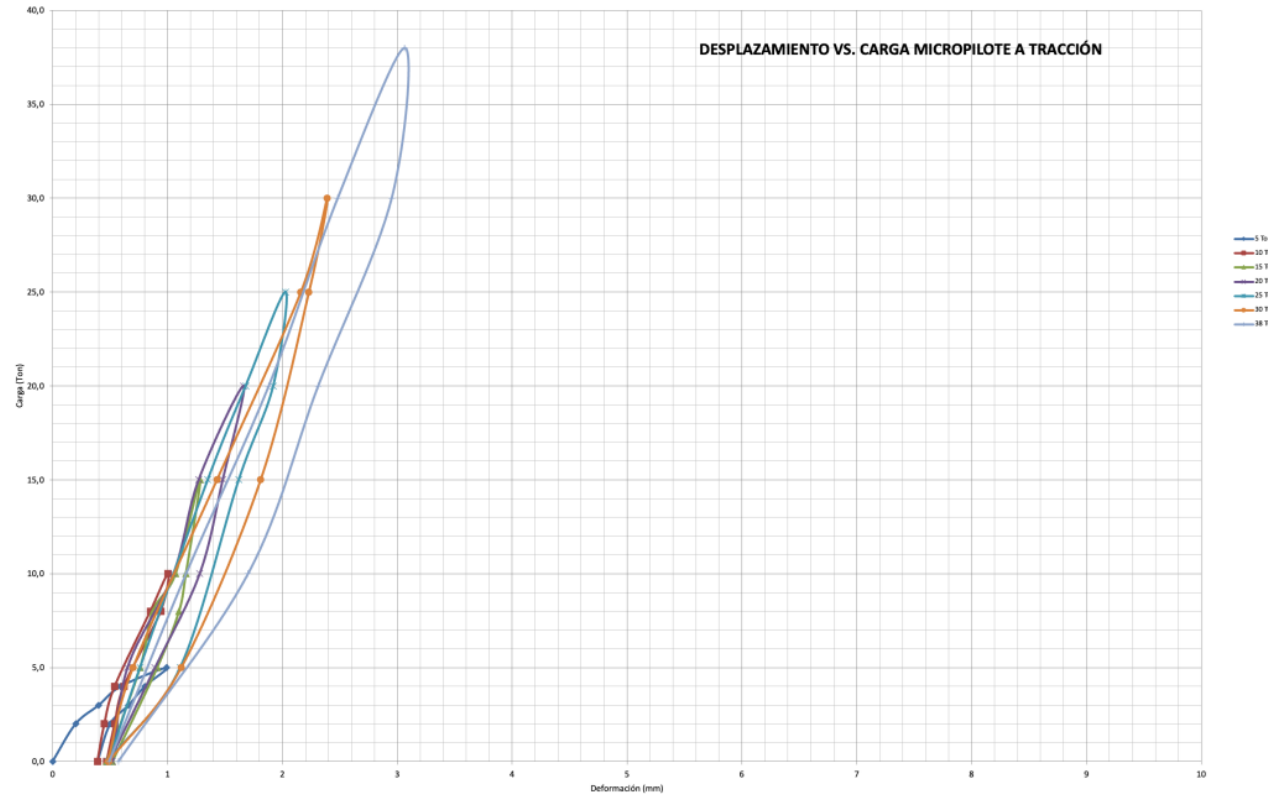
MAQUINAS DEL HORNO



# ENGINEERING CHALLENGES<sub>[3/4]</sub>

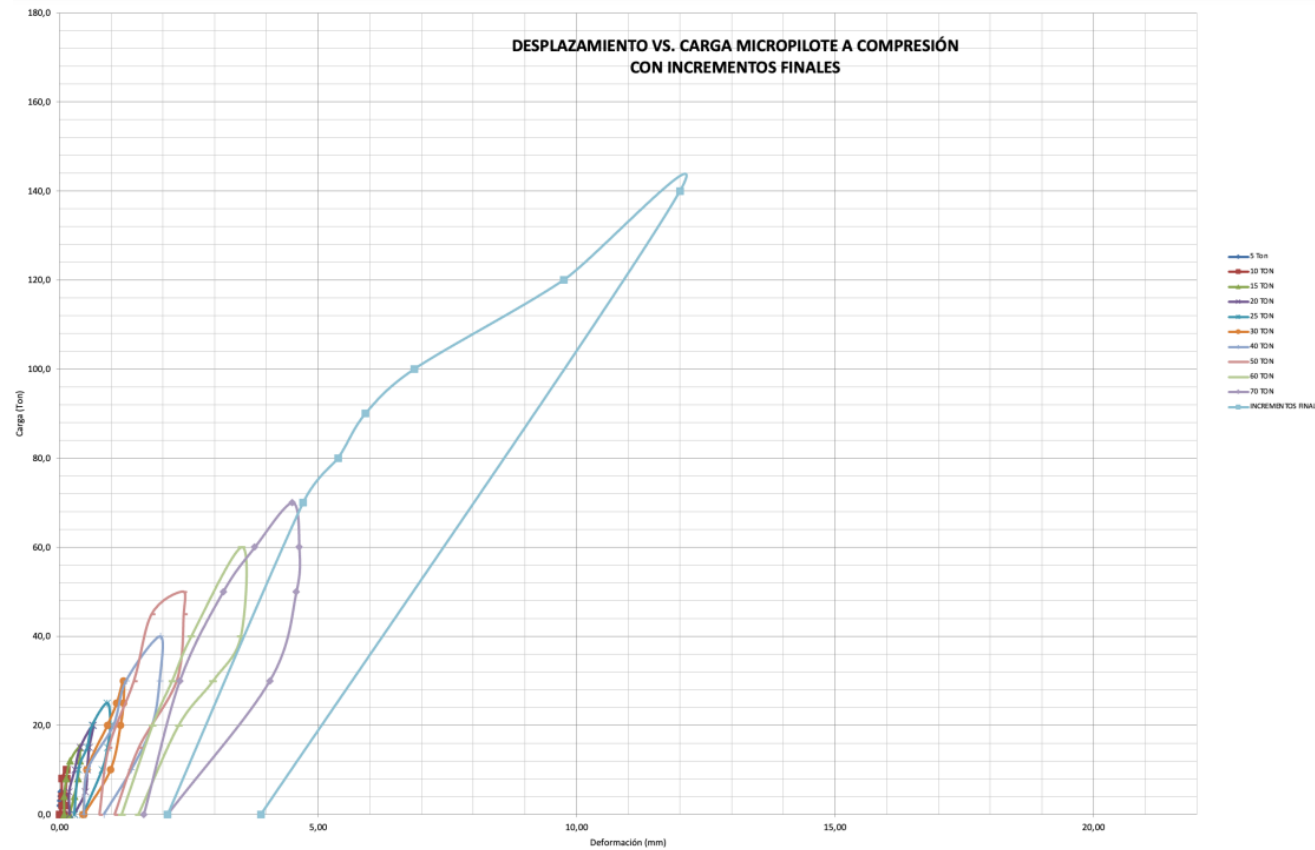
OXYGEN PLANT

TRACTION TEST



# ENGINEERING CHALLENGES<sub>[3/4]</sub>

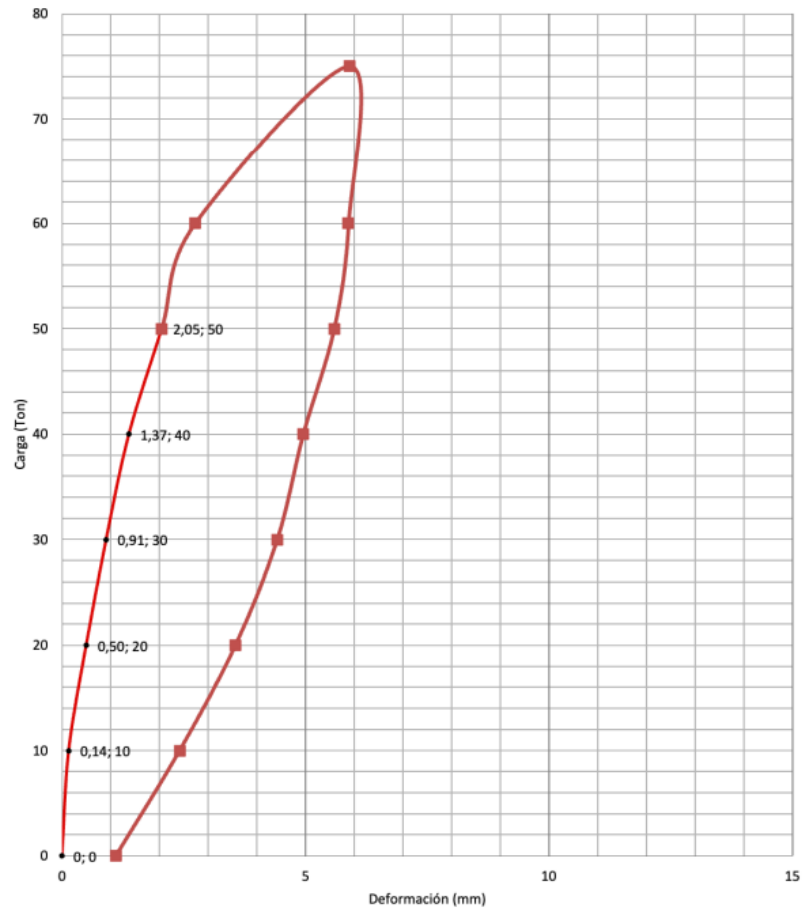
OXYGEN PLANT



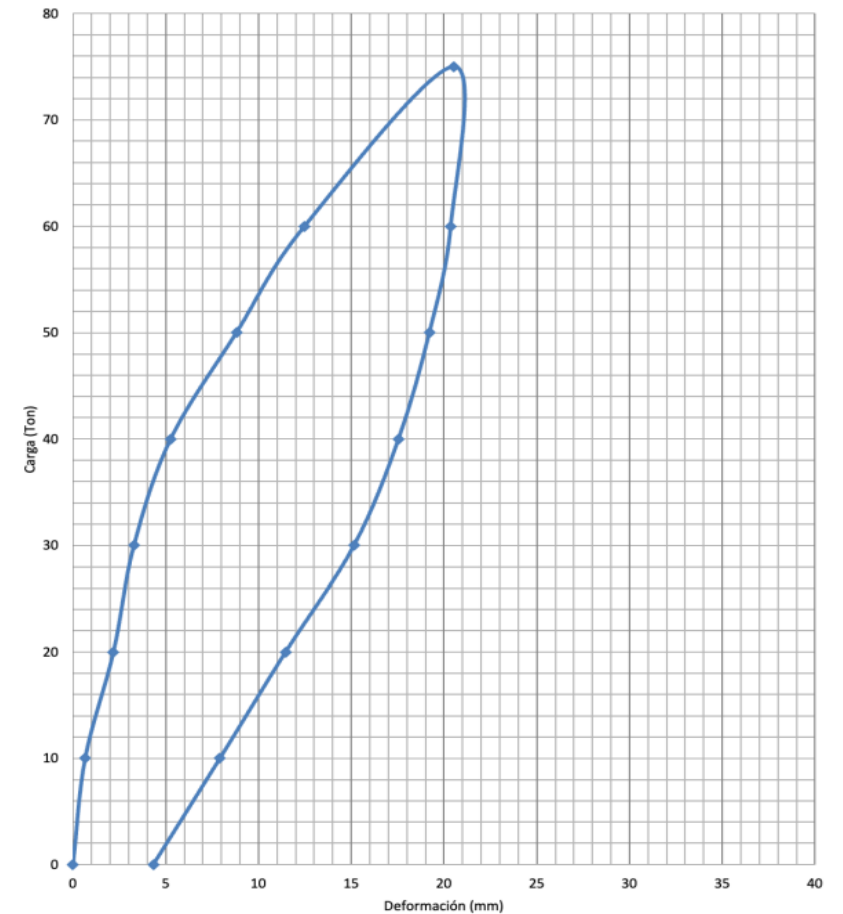
# ENGINEERING CHALLENGES<sub>[4/4]</sub>

## FURNACY MACHINES

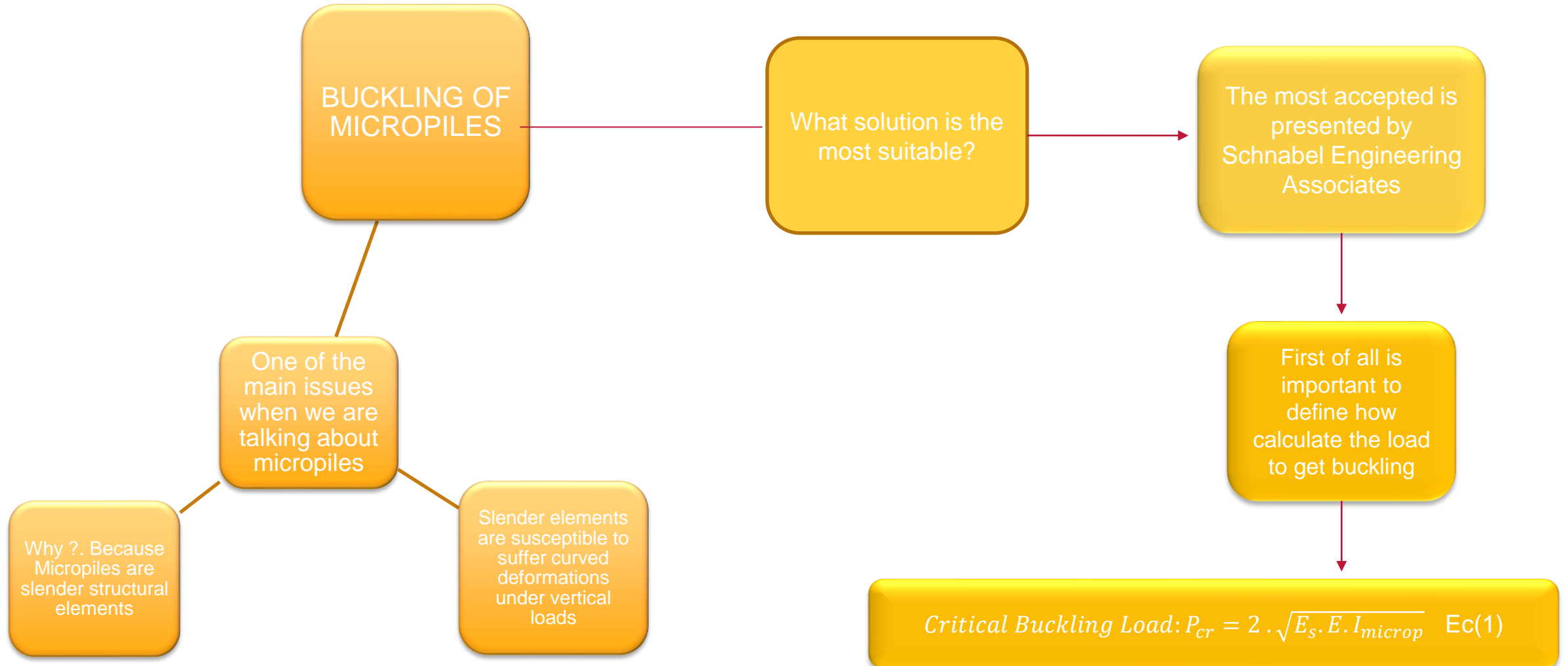
DESPLAZAMIENTO PROMEDIO VS. CARGA  
PRUEBA A TRACCIÓN MICROPILOTE



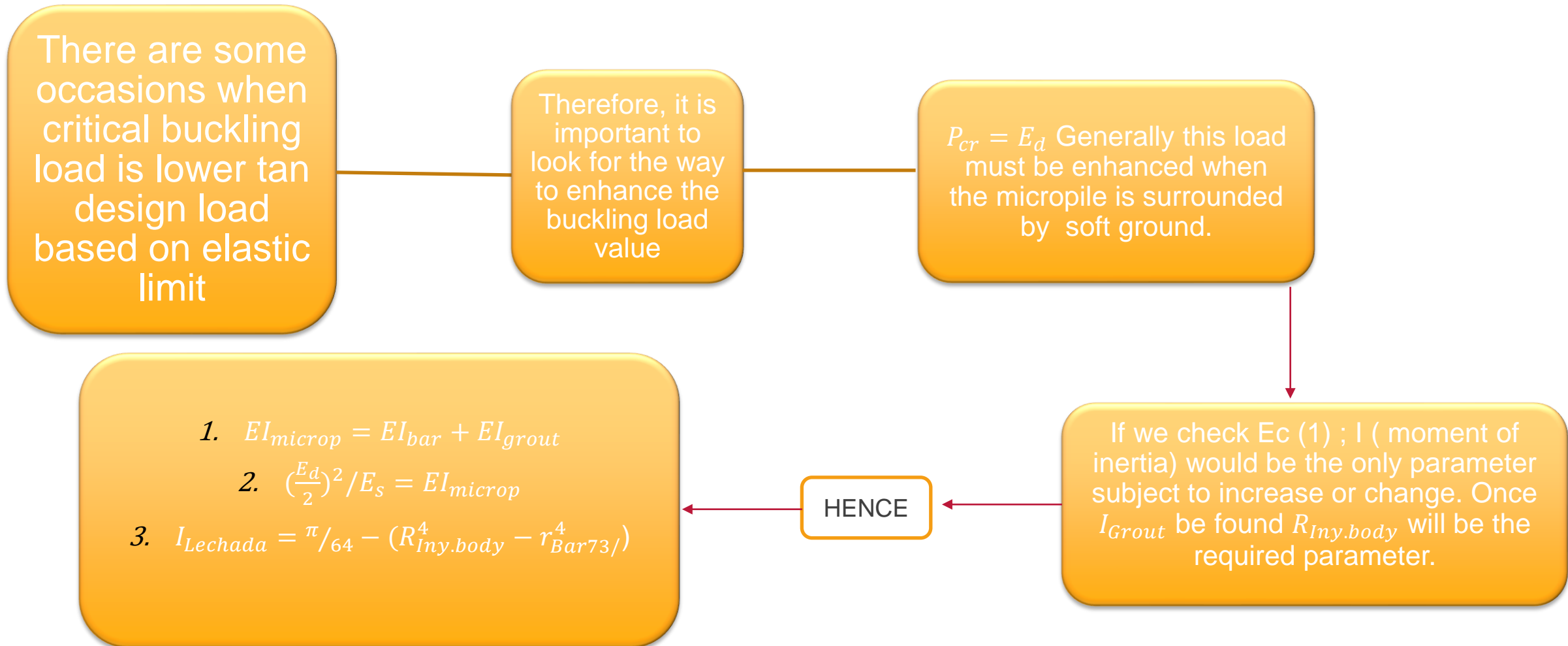
DESPLAZAMIENTO PROMEDIO VS. CARGA  
PRUEBA A TRACCIÓN MICROPILOTE



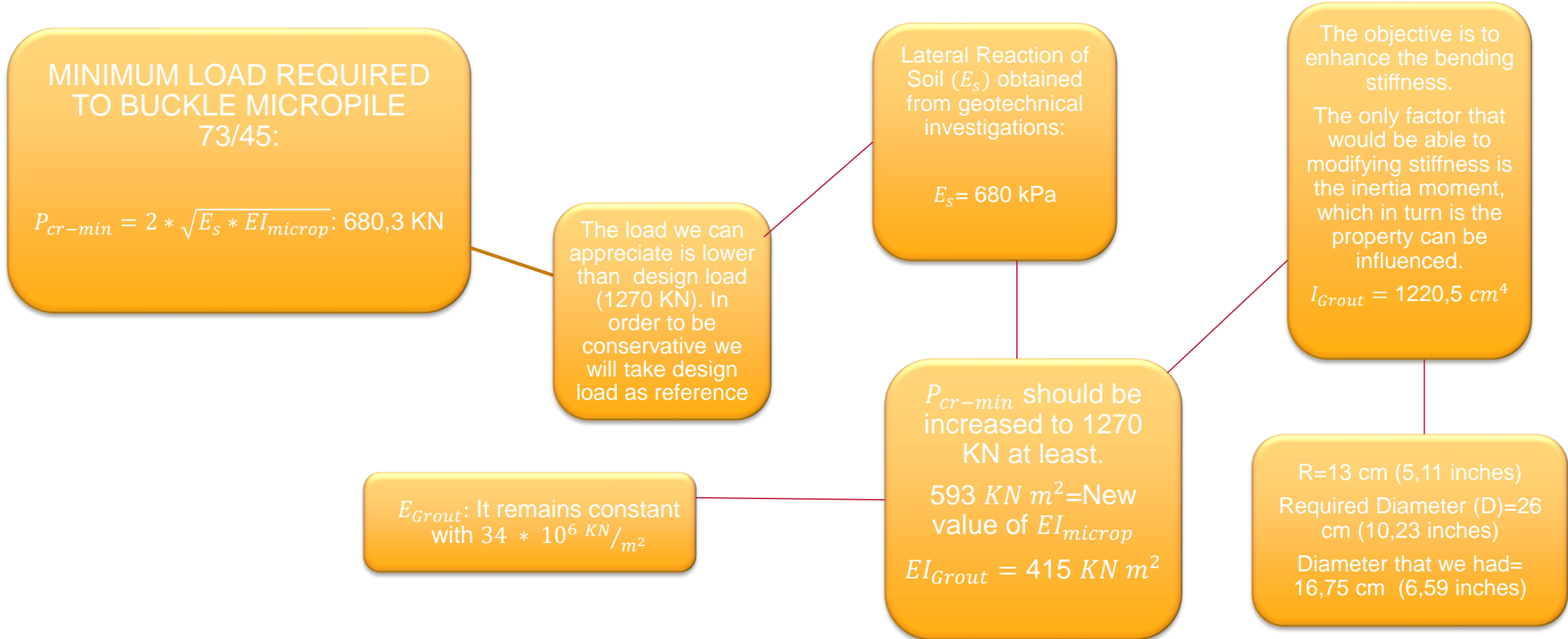
# ENGINEERING CHALLENGES<sub>[4/4]</sub>



# ENGINEERING CHALLENGES<sub>[4/4]</sub>



# ENGINEERING CHALLENGES<sub>[4/4]</sub>





# ENGINEERING CHALLENGES<sub>[4/4]</sub>

WE HAD AN INJECTION BODY DIAMETER EQUAL TO 16,75 cm ( 6,59 inches)

Drill bit has to be increase until reach equal to 25,80 cm (10,23 inches). In order to obtain this diameter

Blades (4) has to be added to drill bit. Each one of these would increase in 5 cm (2 inches) diameter



# RESULTS



**MUCHAS GRACIAS**