

WELL WATER IN THE GUARANI AQUIFER REGION: ANALYSIS OF WATER PURIFICATION BY REVERSE OSMOSIS SYSTEMS

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**Universidad Tecnológica Nacional, Facultad Regional Paraná.
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INTRODUCTION

One of the National Academy of Engineering (NAE) Grand Challenges is the development of effective methods for the purification of water to face the drinking water scarcity issue.



NAE GRAND CHALLENGES FOR ENGINEERING™

MAKE SOLAR ENERGY ECONOMICAL PROVIDE ENERGY FROM FUSION
DEVELOP CARBON SEQUESTRATION METHODS MANAGE THE NITROGEN
CYCLE PROVIDE ACCESS TO CLEAN WATER RESTORE AND IMPROVE
URBAN INFRASTRUCTURE ADVANCE HEALTH INFORMATICS ENGINEER
BETTER MEDICINES REVERSE-ENGINEER THE BRAIN PREVENT NUCLEAR
TERROR SECURE CYBERSPACE ENHANCE VIRTUAL REALITY ADVANCE
PERSONALIZED LEARNING ENGINEER THE TOOLS OF SCIENTIFIC DISCOVERY

INTRODUCTION: OBJECTIVE



Many times the problem is not the lack of water but rather the lack of effective methods to purify that water.

The aim of this work is to propose Reverse Osmosis systems as an effective alternative to the treatment of groundwater, specifically applied in the Guaraní Aquifer region.

INTRODUCTION: PRESENTATION MAP

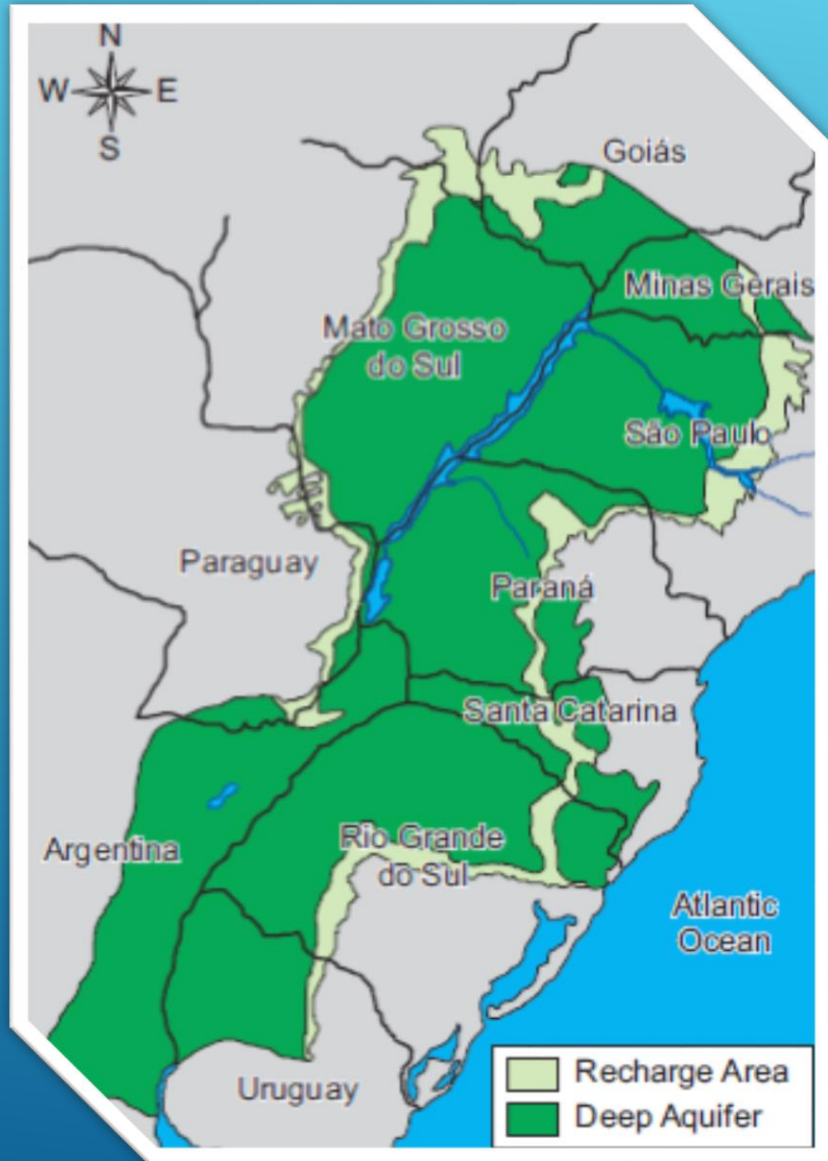


Current state of the Guarani Aquifer.

Concept of Reverse Osmosis as a tool in water purification processes.

Reverse Osmosis and the Guarani Aquifer.

Economic analysis and advantages of Reverse Osmosis systems.



GUARANI AQUIFER

- ▶ It is one of the biggest freshwater reservoirs
- ▶ It is distributed between Brazil, Argentina, Paraguay and Uruguay.
- ▶ The amount of water is estimated at 35000 Km³, enough to supply the next generations

GUARANI AQUIFER: ECONOMIC ACTIVITY

Remarkable activities:

- ▶ Agriculture
- ▶ Animal breeding

It is a region with a relatively low population density.

Small cities and towns without a nearby river fulfil the water demand with groundwater.



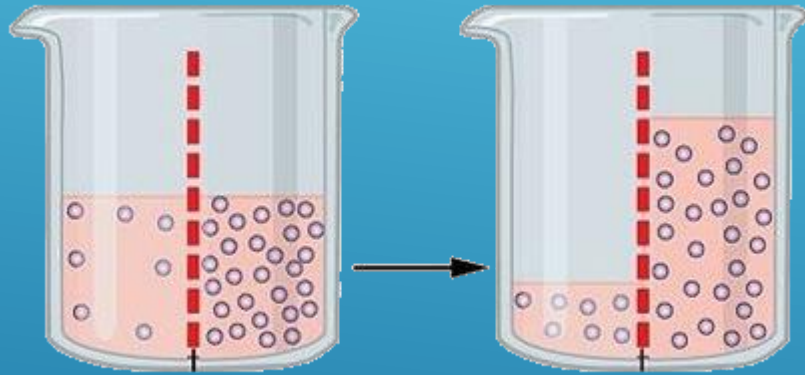


POLLUTANTS PRESENT IN UNDERGROUND WATER

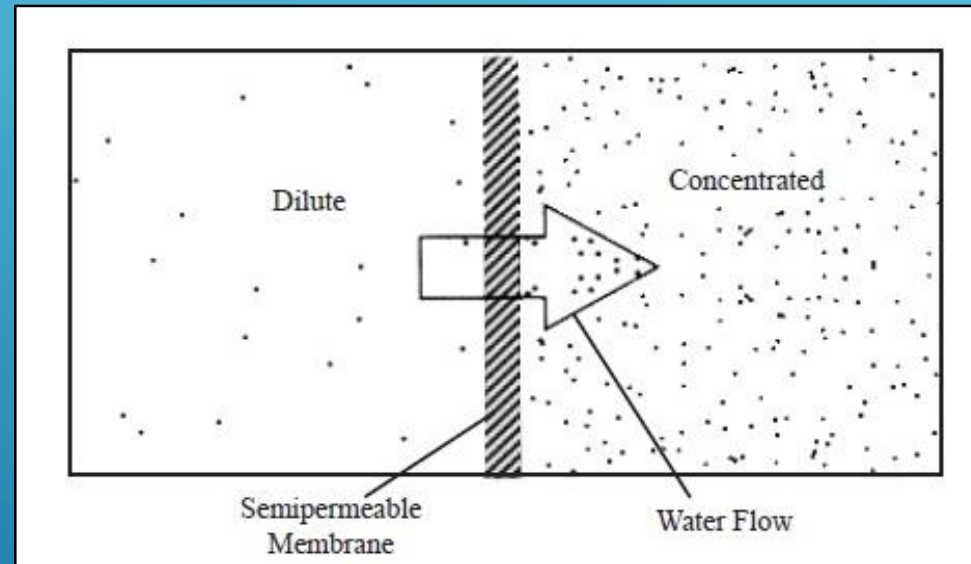
The most common pollutants that can be found in groundwater are:

- ▶ Pesticides
- ▶ Minerals
- ▶ Microorganisms

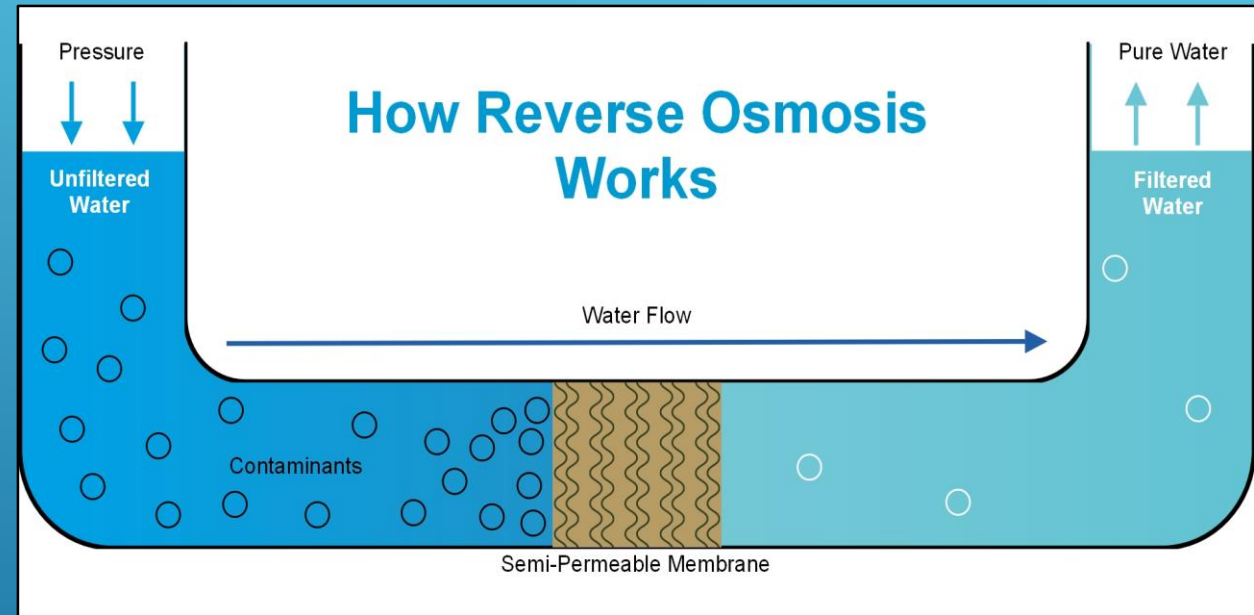
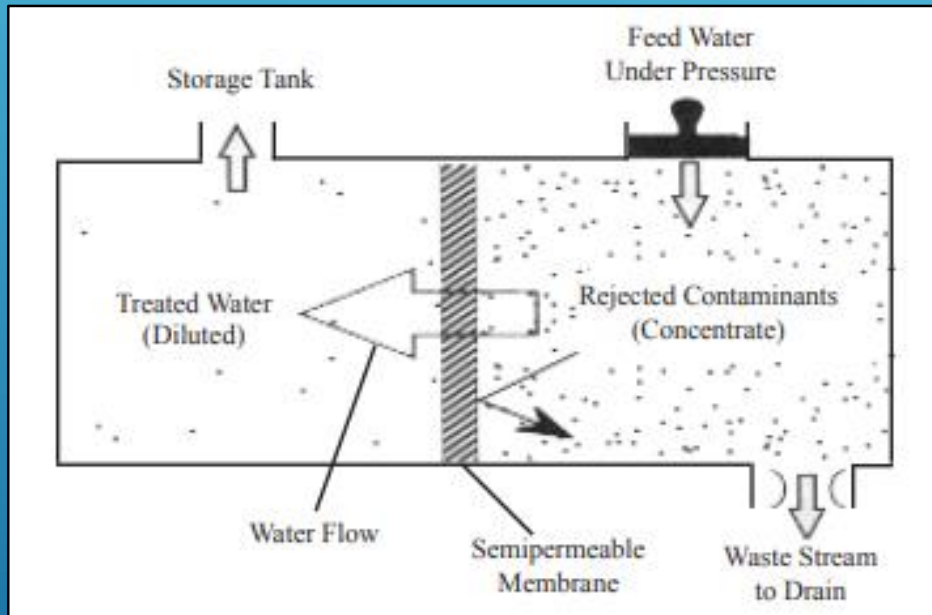
OPERATING PRINCIPLE: OSMOSIS



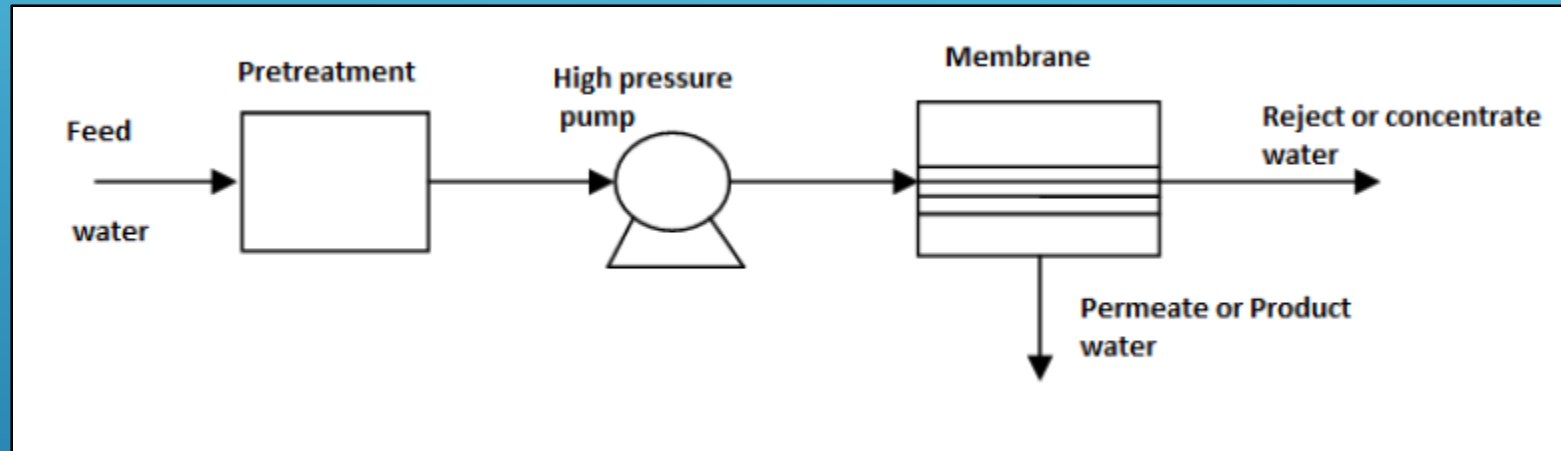
Concentrations stabilize when the ratio of the amount of water to the amount of particles on both sides of the membrane is the same.



OPERATING PRINCIPLE: REVERSE OSMOSIS

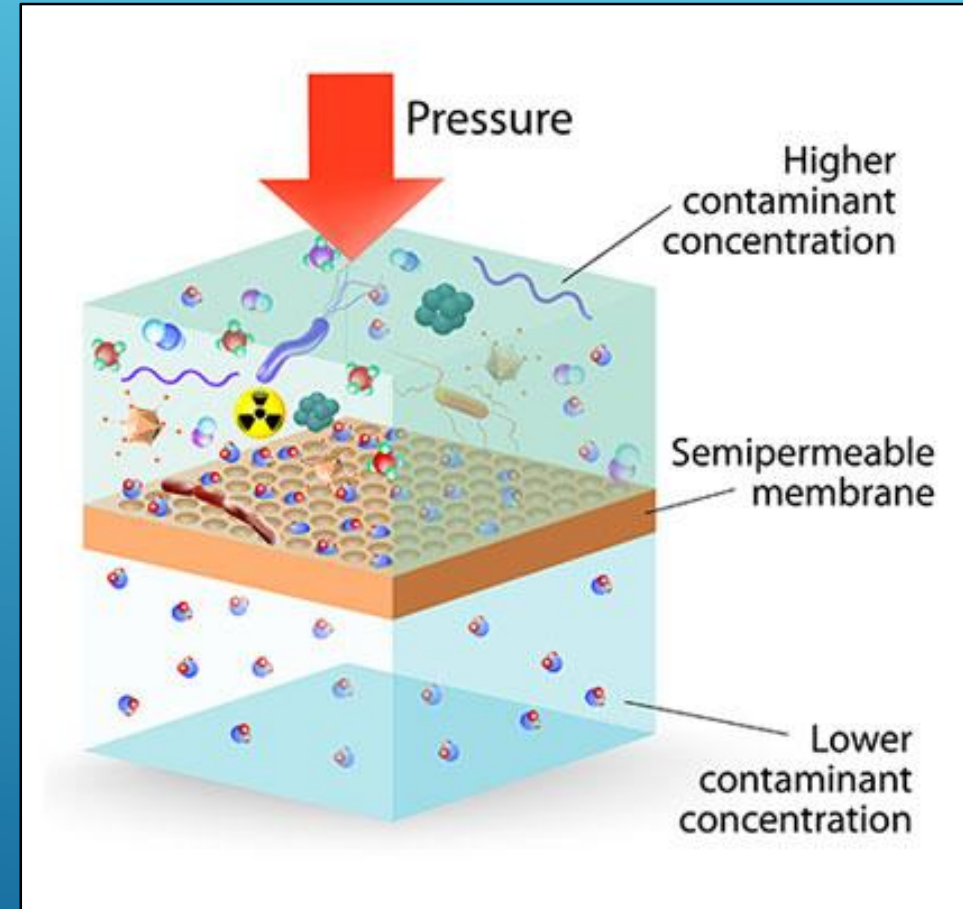
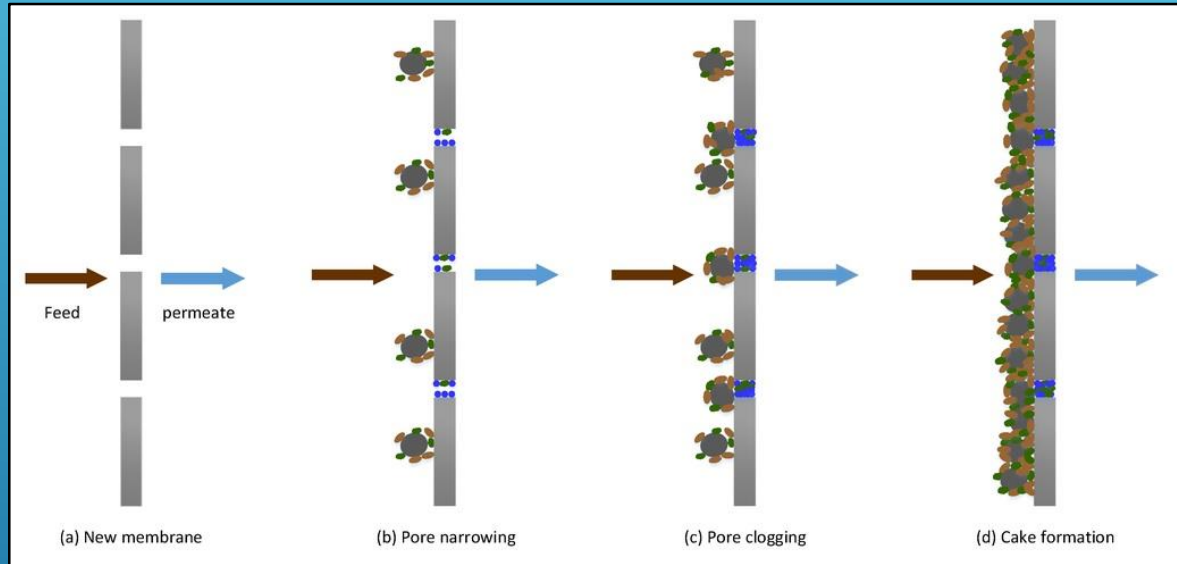


STAGES OF THE PROCESS



The pretreatment of the water is important, because if the feed water contains large particles and a lot of pressure is applied, the membrane will be damaged.

PRETREATMENT PROCESS



In Reverse Osmosis systems, the pretreatment is generally carried out by means of activated carbon filters.

GUARANÍ AQUIFER AND REVERSE OSMOSIS

There is a potential risk of contamination of the water in the Guaraní Aquifer due to the large presence of herbicides and pesticides in the agricultural area.

Reverse Osmosis systems are capable of filtering different types of biological agents and organic and inorganic compounds present in groundwater.



REVERSE OSMOSIS COMBINED WITH ACTIVATED CARBON

- No single piece of treatment equipment manages all contaminants. All treatment methods have limitations and regular situations require a combination of treatment processes to effectively treat water.
- Activated Carbon filtration and sediment filtration are commonly used in conjunction with Reverse Osmosis membranes
- Activated carbon filters remove certain pesticides and microorganisms that the reverse osmosis membrane is not as effective in removing.



ADVANTAGES OF REVERSE OSMOSIS

- Simplicity
- Cost
- Low power requirement



SIMPLICITY



SIMPLICITY


Low and easy maintenance

- Change pretreatment filter annually.
- Replace membrane: for hard water every 2-3 years and for soft water every 5-7 years.
- Drain the storage tank every 2 week.



COST

Low cost, high benefits



The image shows a Pura OIPLUS water purifier system. It consists of a white rectangular reservoir on the left, a central unit with three vertical filter cartridges labeled 'pura', and a curved faucet on the right. The central unit has 'pura OIPLUS' and 'Tecnología AISA' printed on it. The filter cartridges also have the 'pura' logo and a water drop icon.

Ósmosis Inversa Bajo
Mesada Purificador Agua
De Pozo Pura Oi Plus
| elimina Arsénico
Bacterias Sales Nitratos
Flúor

★★★★★ 19 opiniones

\$ 29.645

\$1000 per month in maintenance

COST

Reverse Osmosis system



Less than \$0,30 per liter

VS

Bottled water



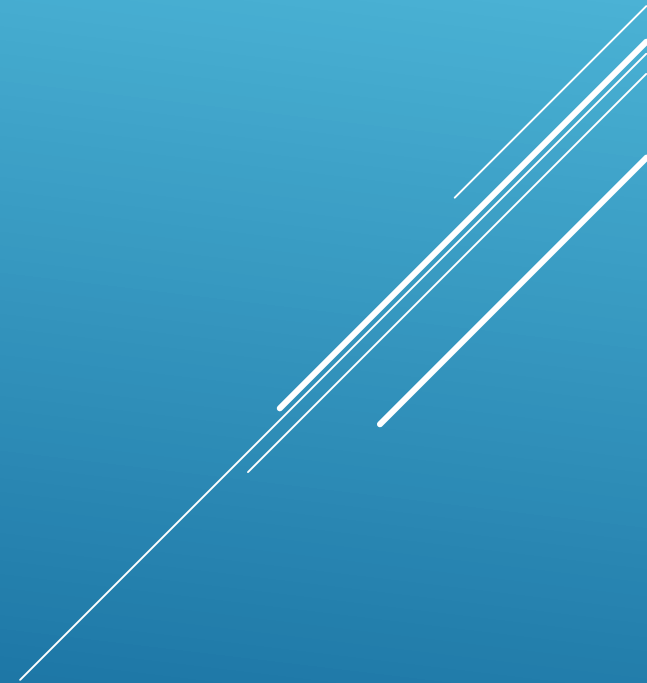
App \$10 per liter

LOW POWER REQUIREMENT

Reverse Osmosis systems have low power requirements.



CONCLUSIONS



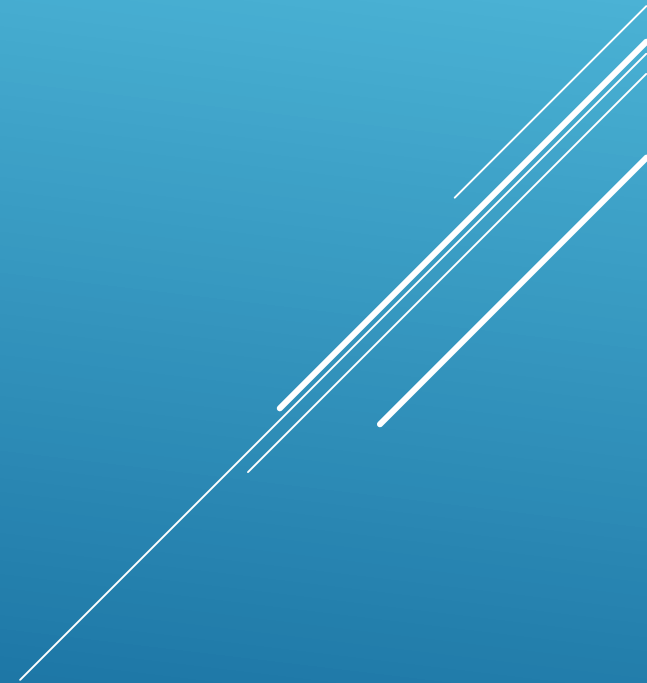
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THANK FOR YOUR
ATTENTION!



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INGLÉS II – UTN FRP



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