Experimental aparatus

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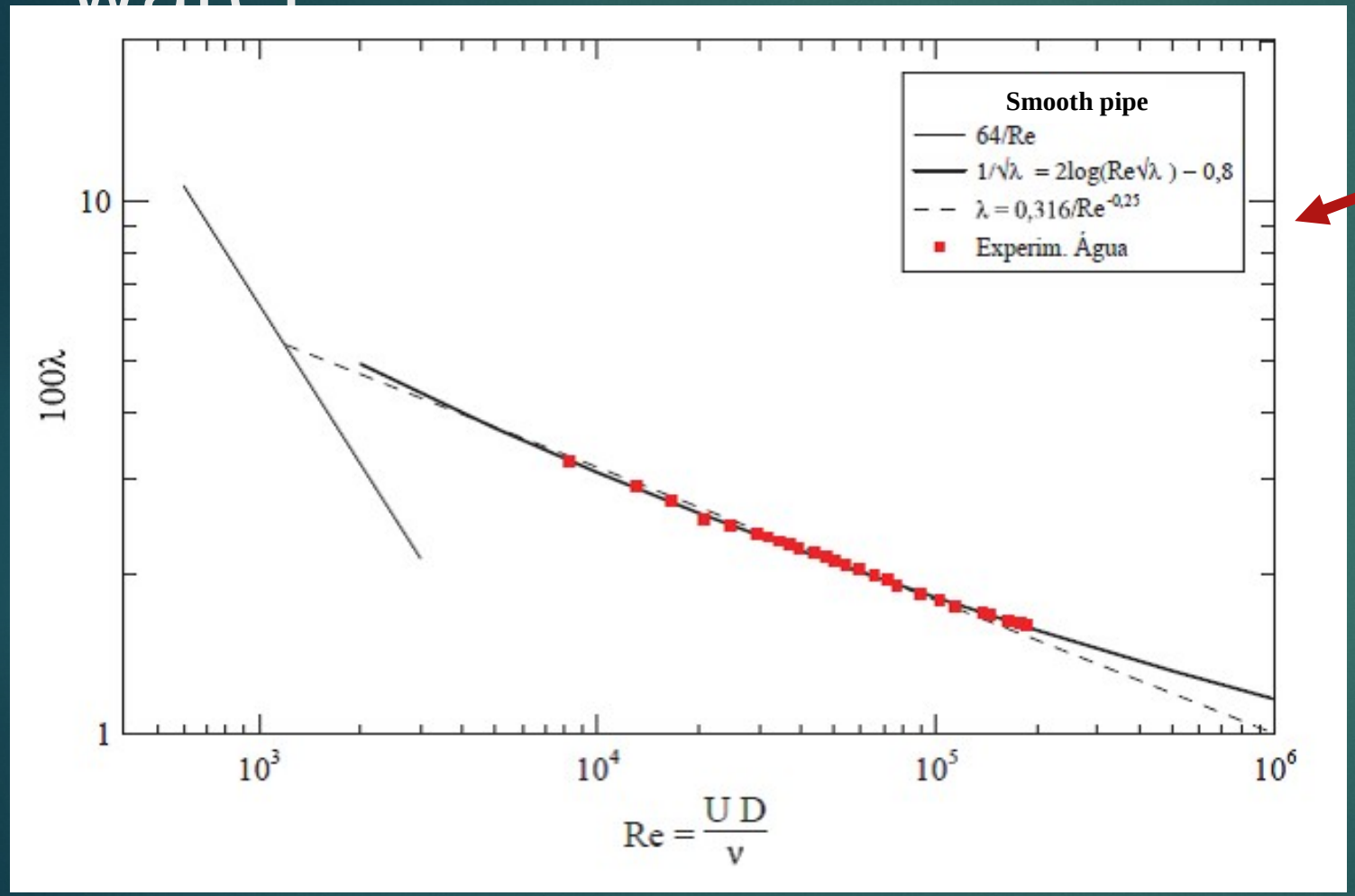
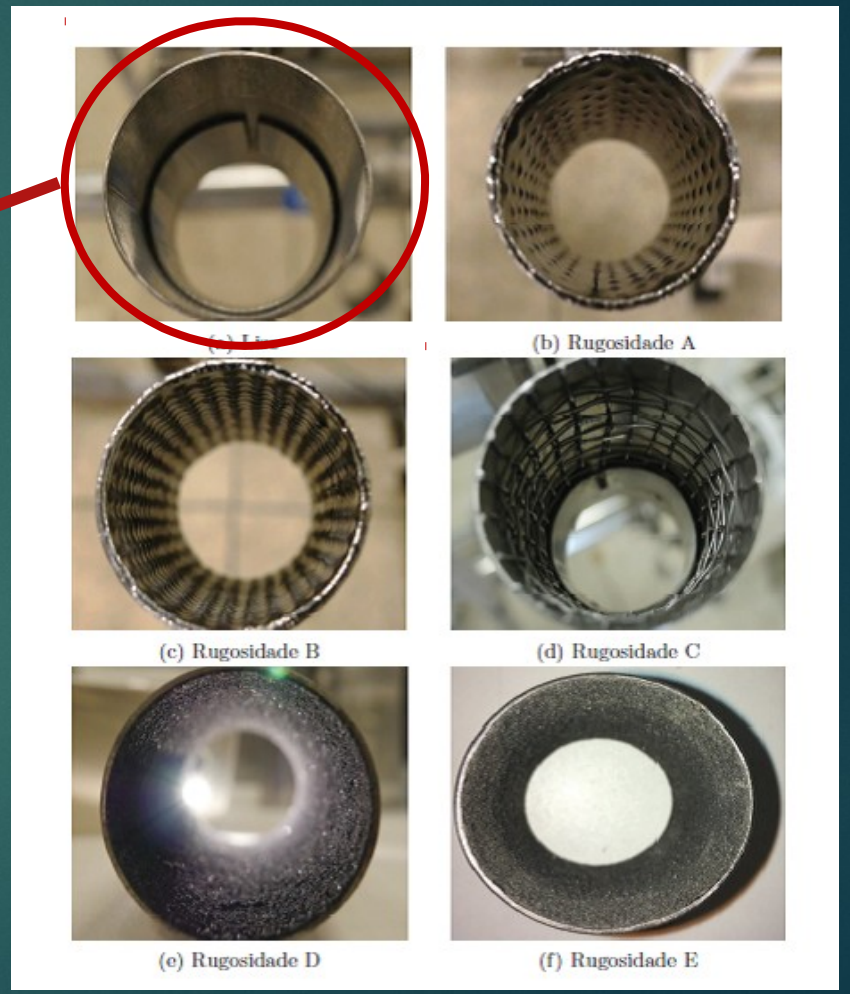
Study of the effect of the polymer in water

- The apparatus experimental is made up of 6 closed circuits, built with stainless steel pipes 15 m long and 2 inches in external diameter.
- Measurements
  - Flow rate
  - Pressure drop

Smooth and roughness surfaces for water





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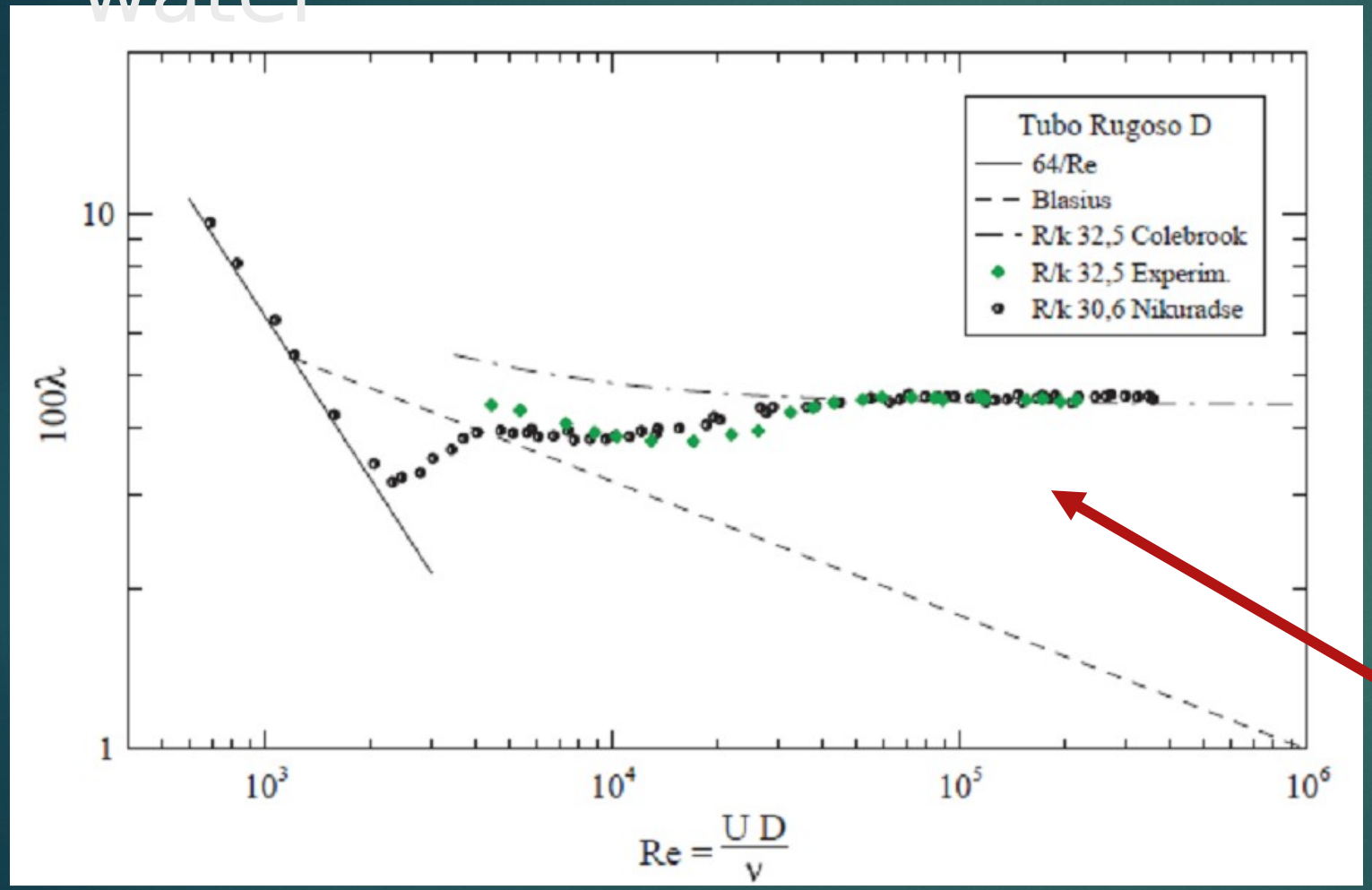

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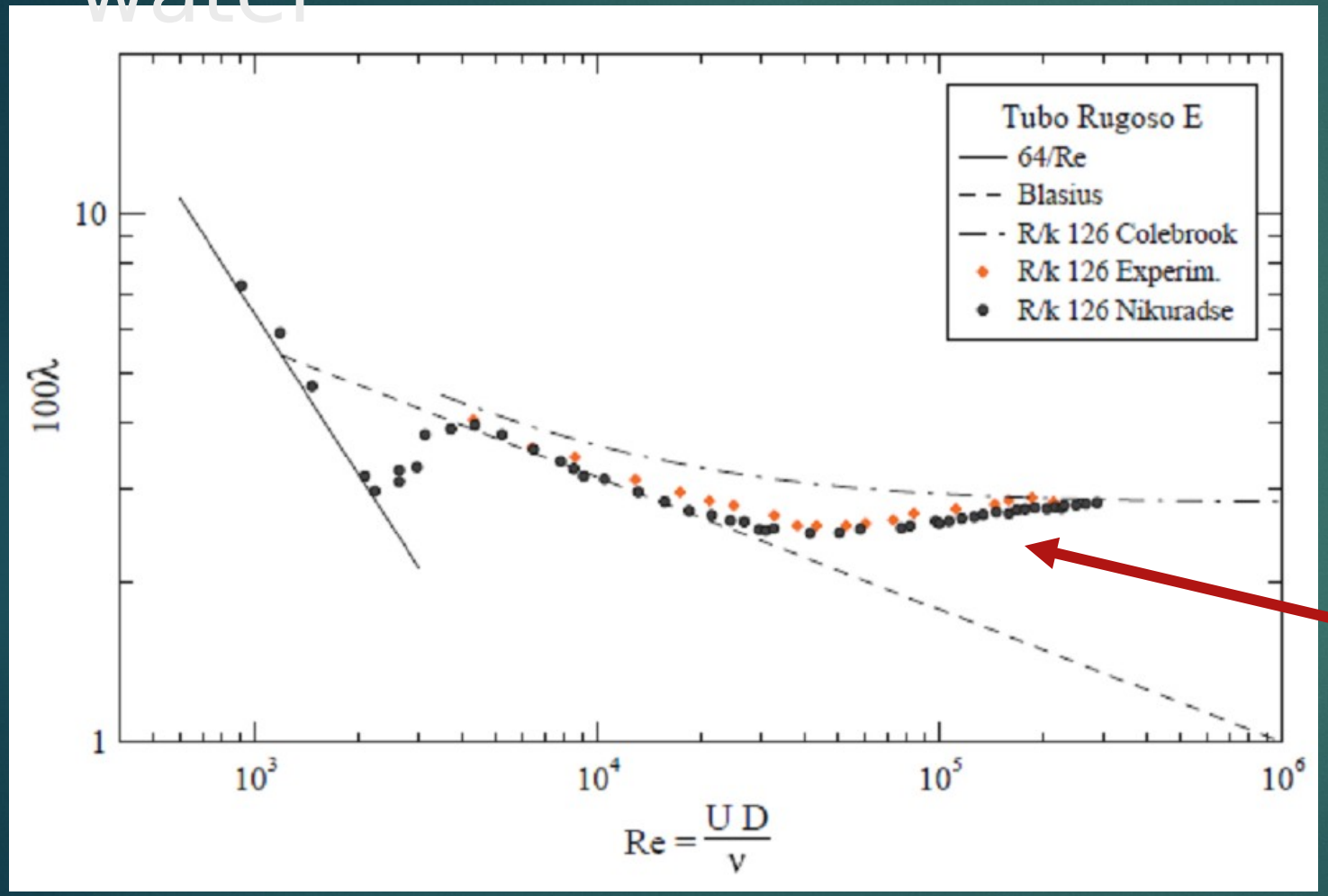

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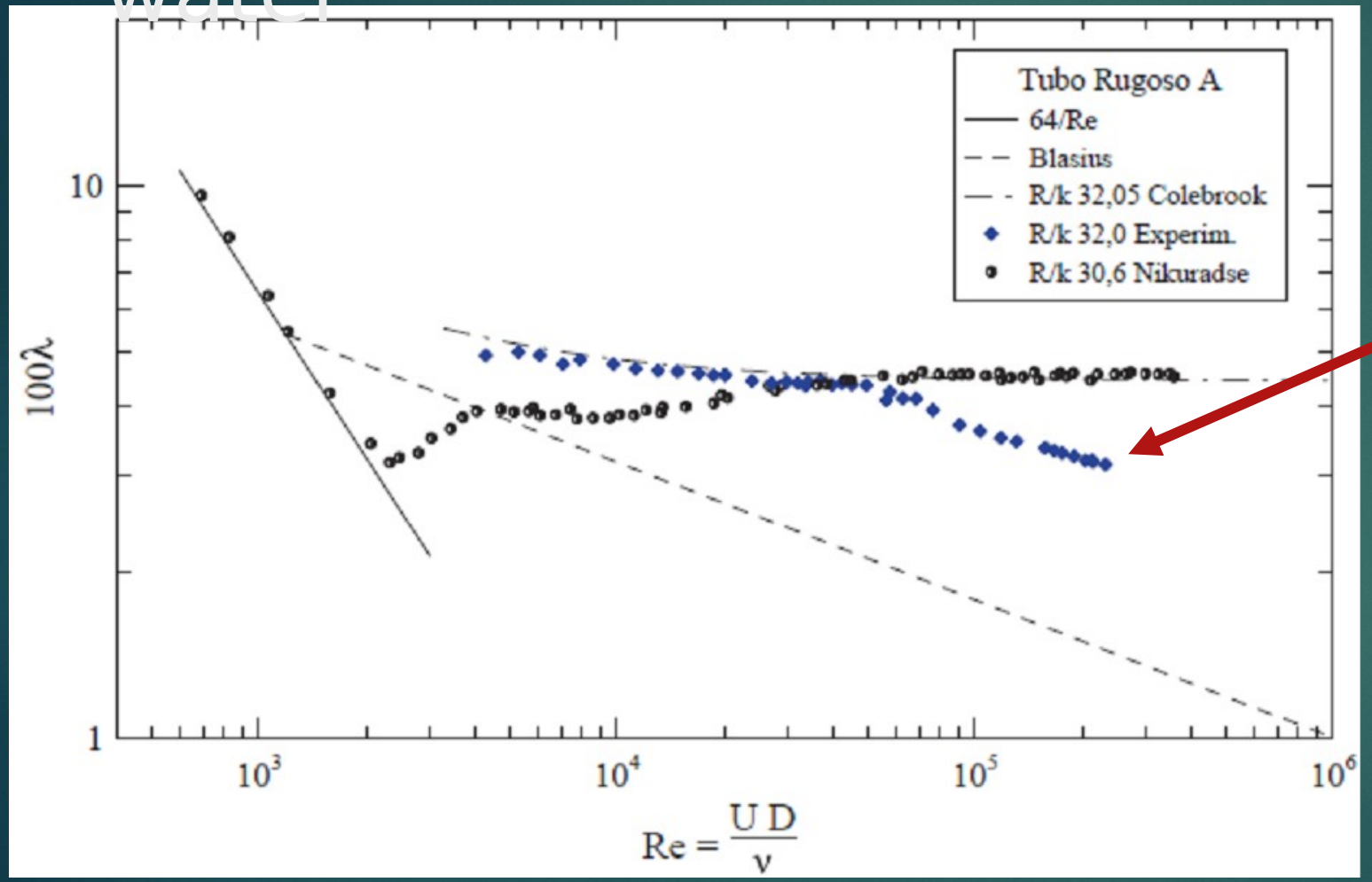
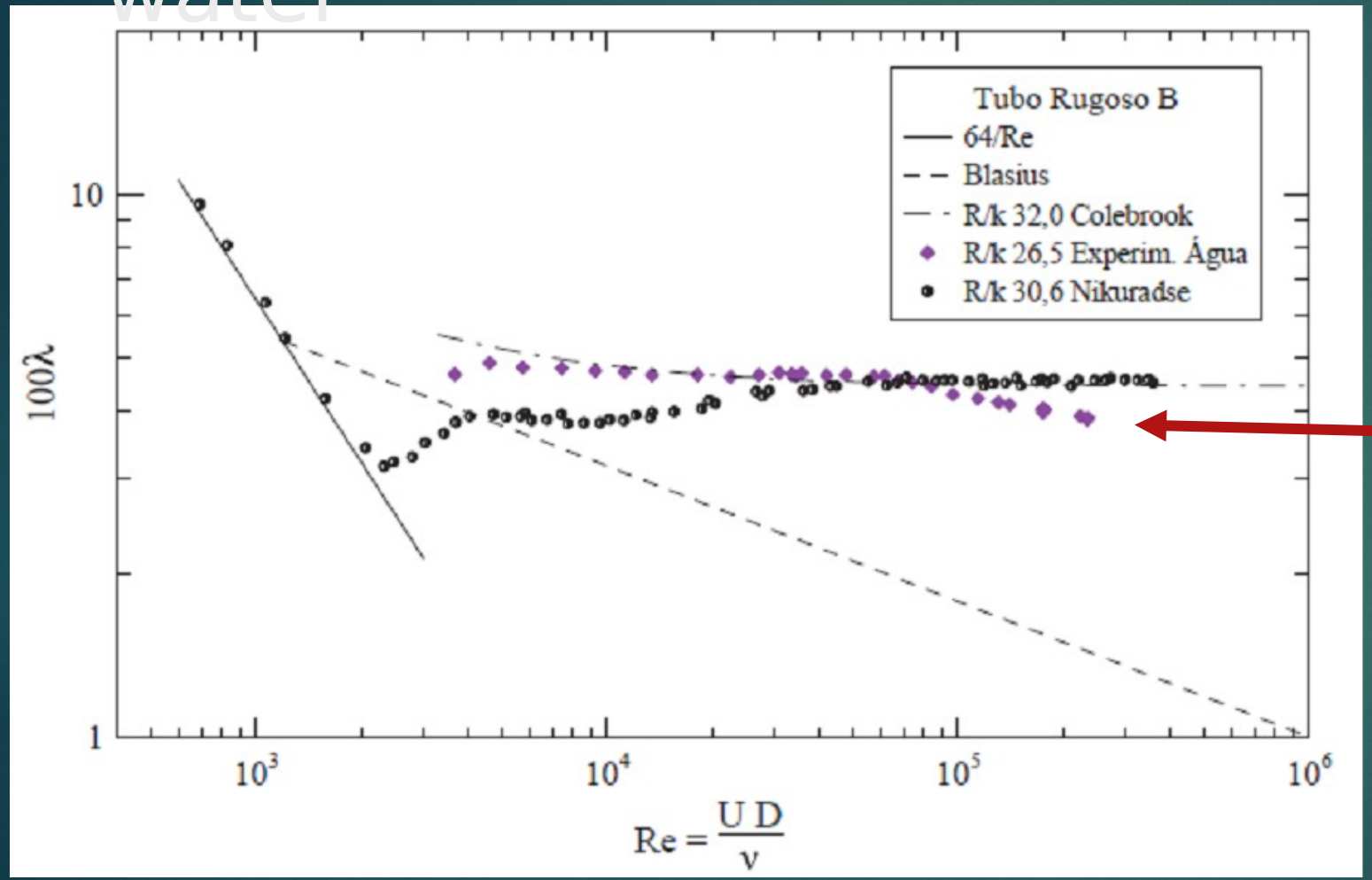


Smooth and roughness surfaces for water



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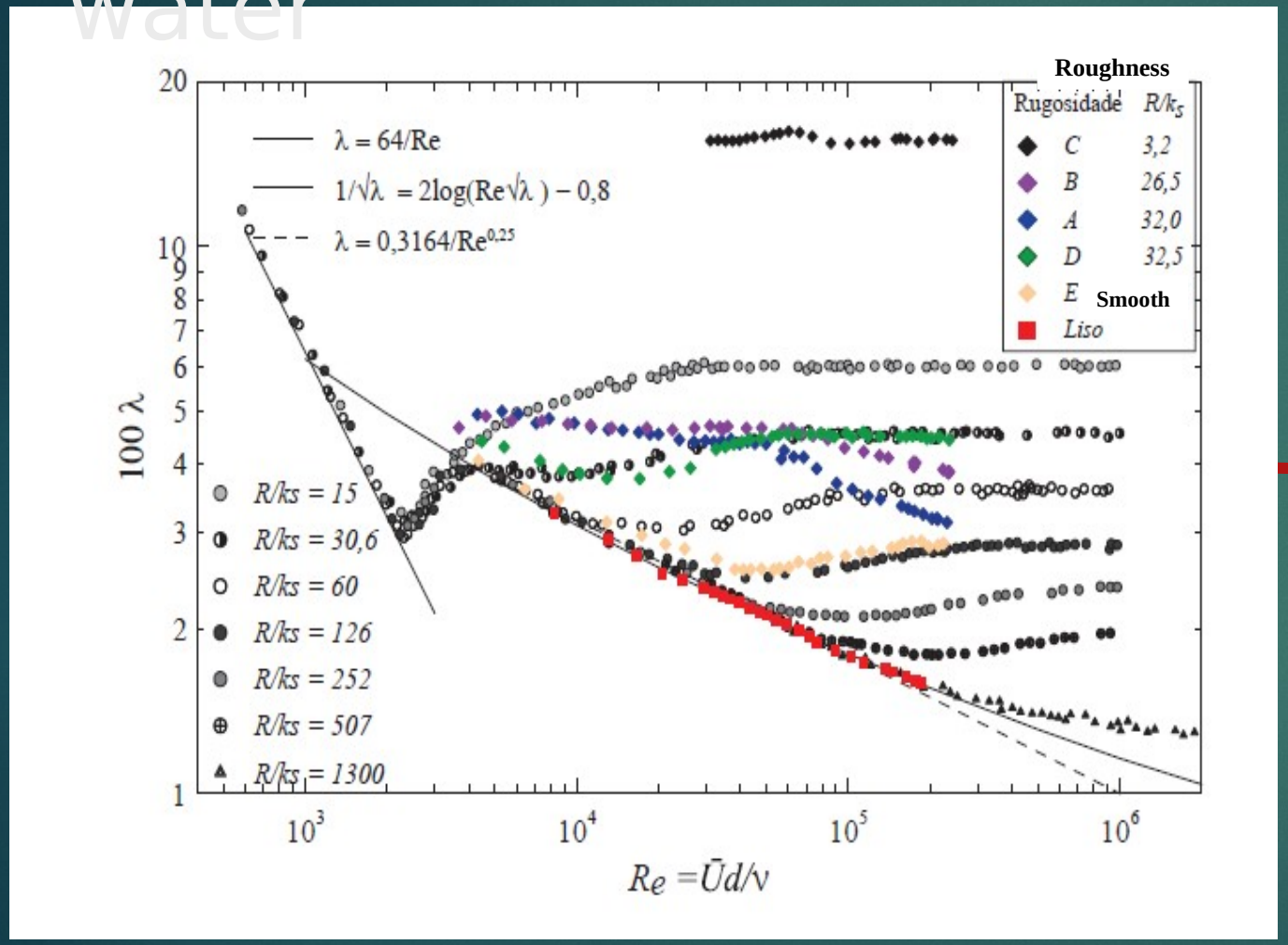
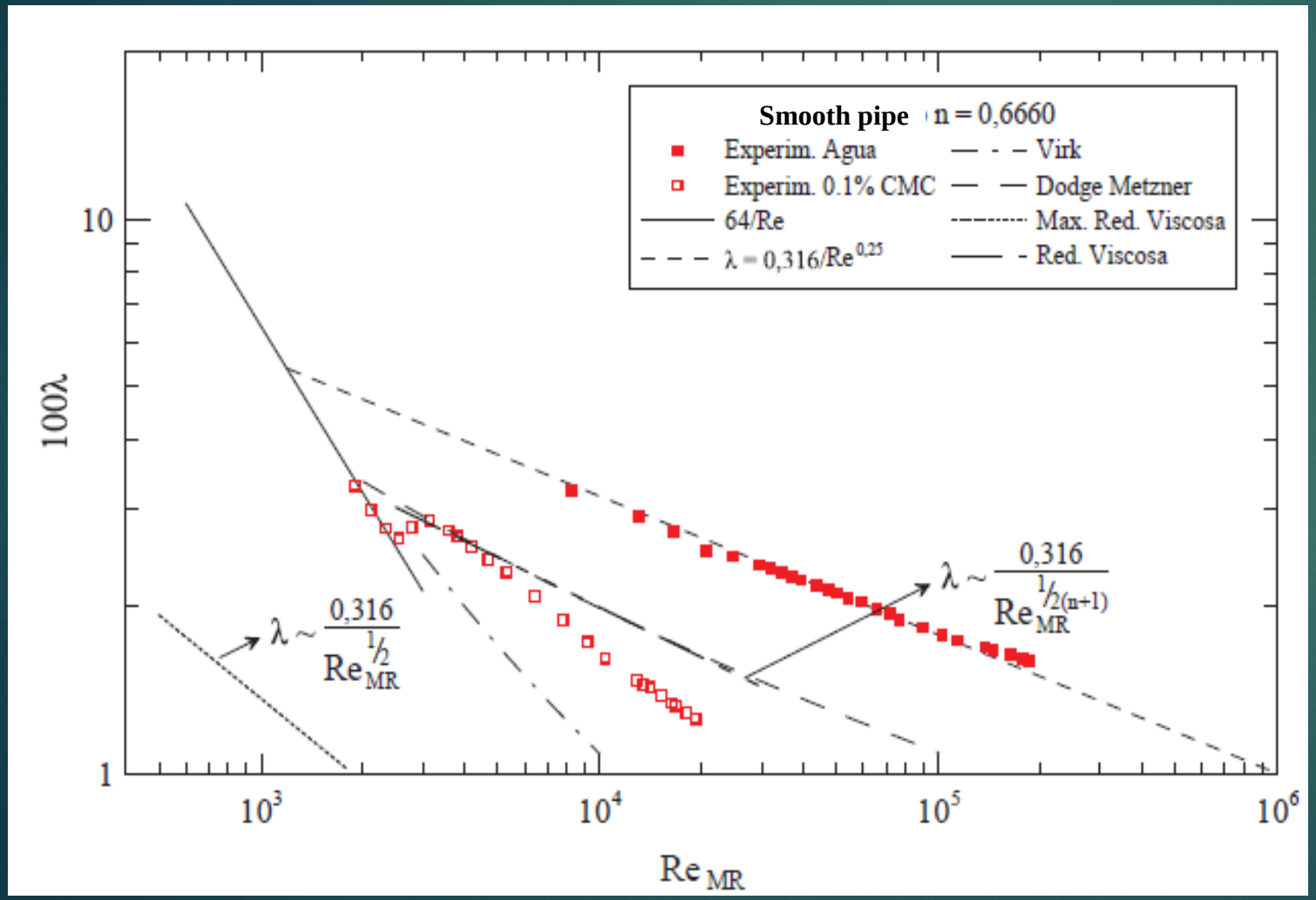
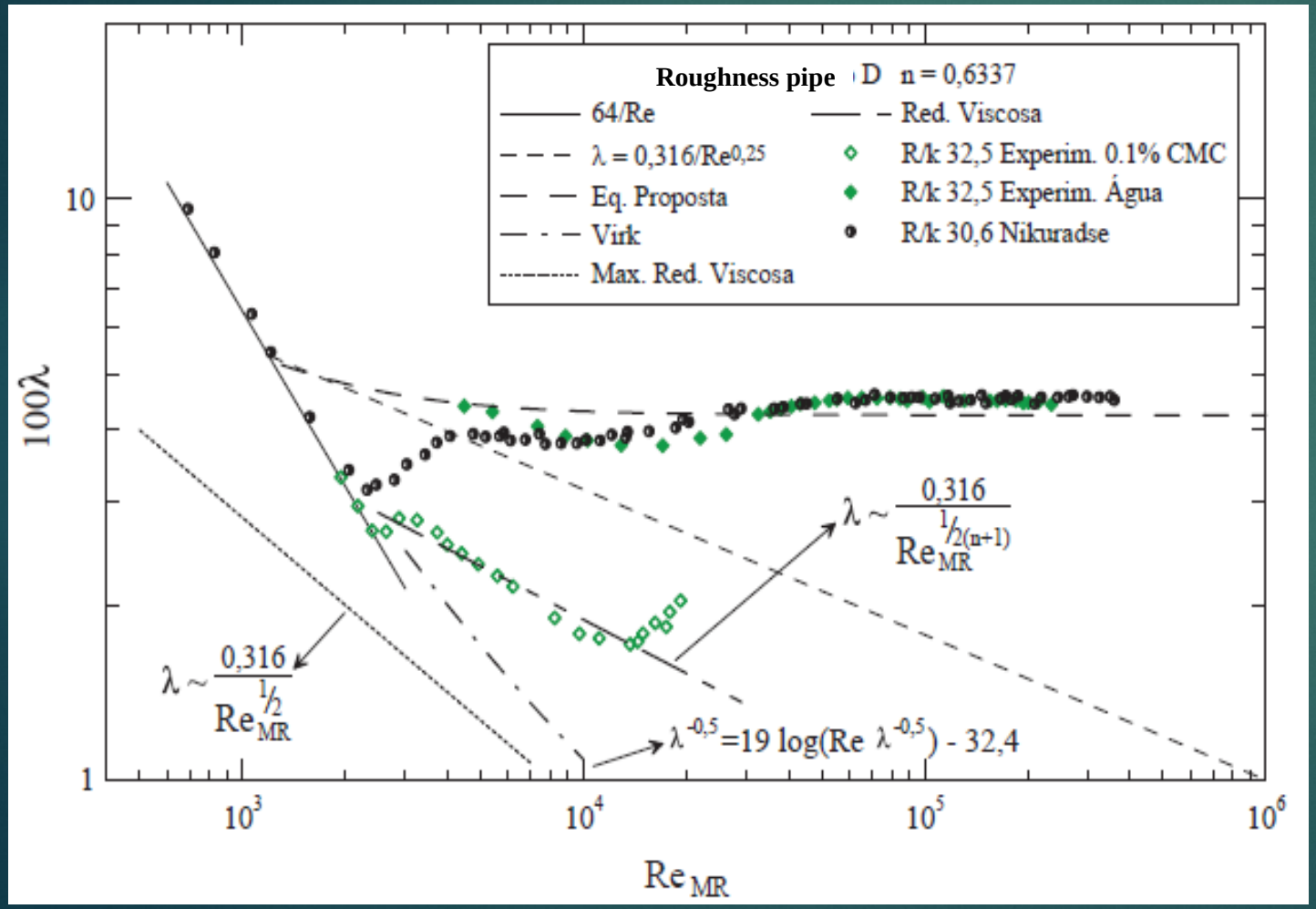


Smooth and roughness surfaces for water with polymer



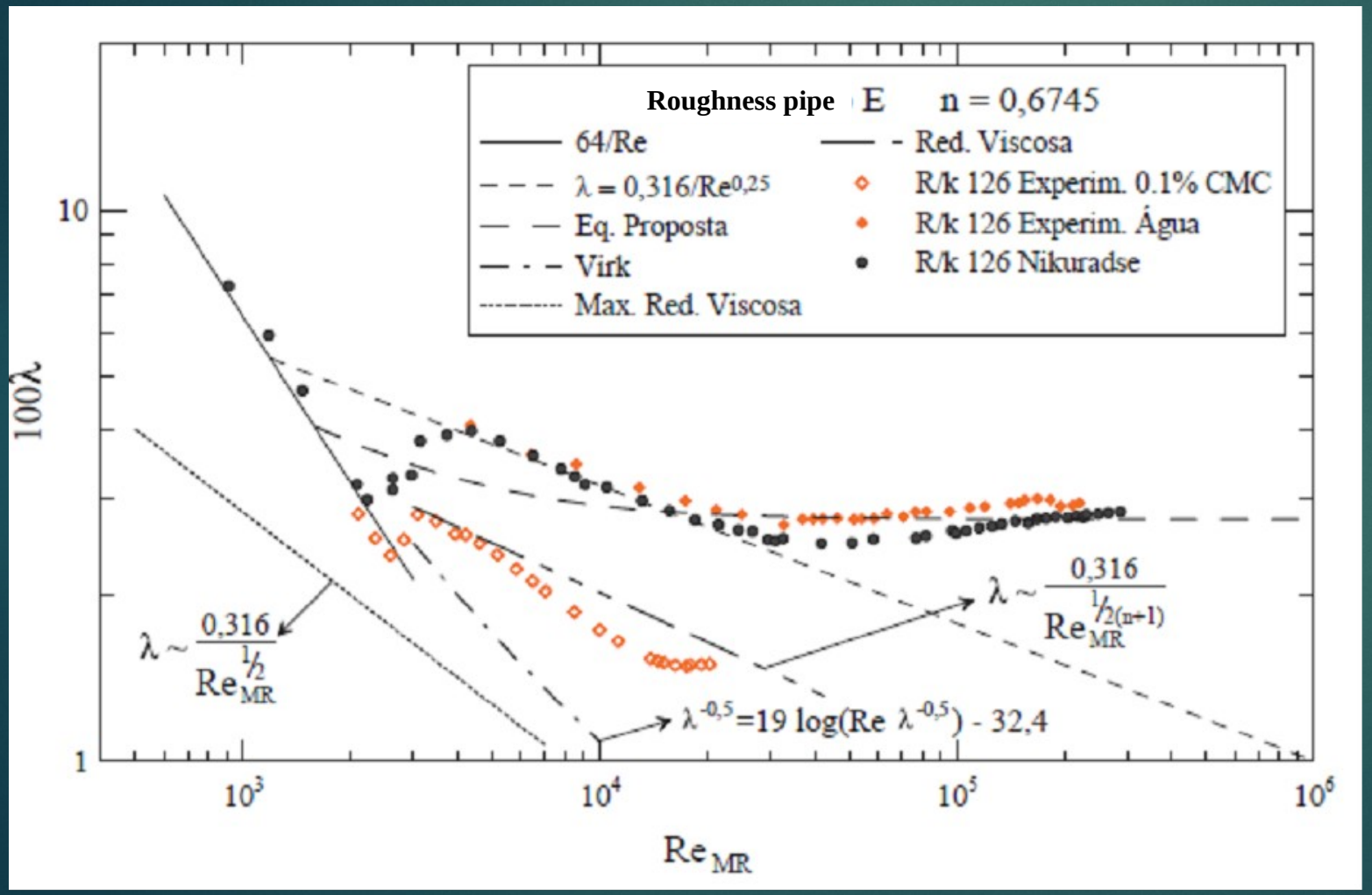
- Smooth pipe
- Polymer – CMC – concentration 0,1%
- The fluid rheology was monitored
- The influence of the temperature was verify and the temperature was monitored

Smooth and roughness surfaces for water with polymer



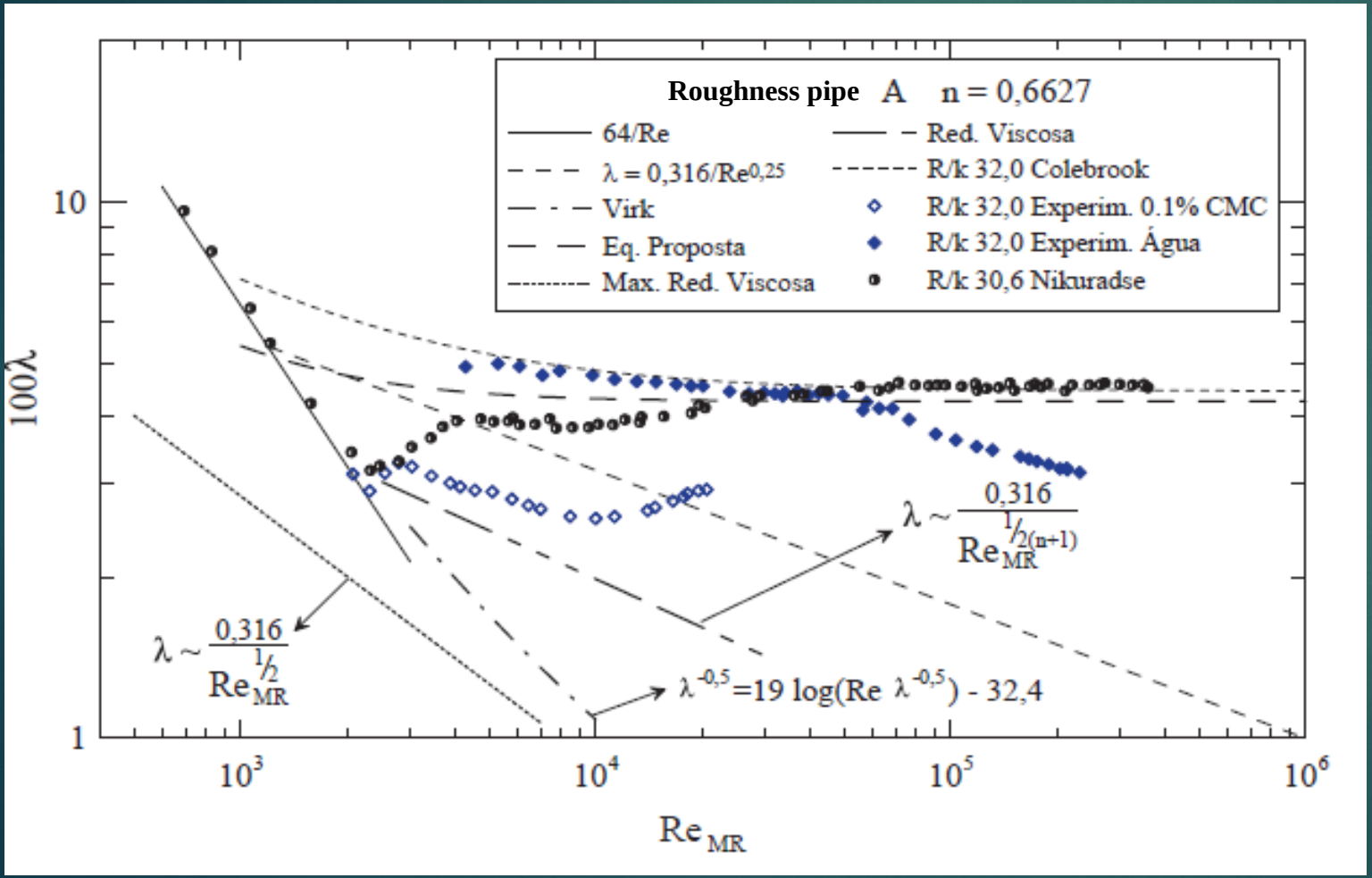
- Roughness pipe D
- Polymer – CMC – concentration 0,1%
- The fluid rheology was monitored
- The influence of the temperature was verify and the temperature was monitored

Smooth and roughness surfaces for water with polymer



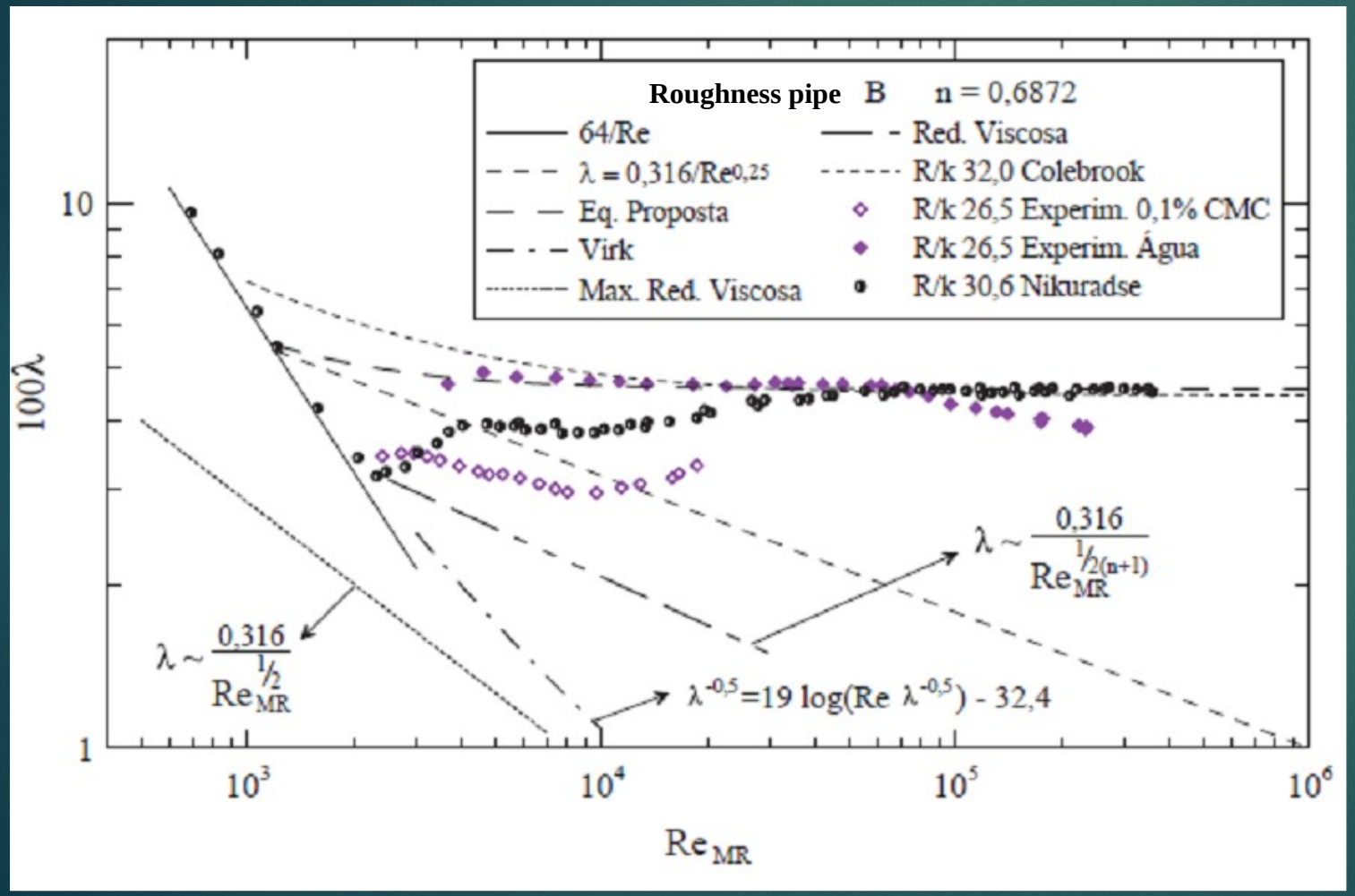
- Roughness pipe E
- Polymer – CMC – concentration 0,1%
- The fluid rheology was monitored
- The influence of the temperature was verify and the temperature was monitored

Smooth and roughness surfaces for water with polymer



- Roughness pipe A
- Polymer – CMC – concentration 0,1%
- The fluid rheology was monitored
- The influence of the temperature was verify and the temperature was monitored

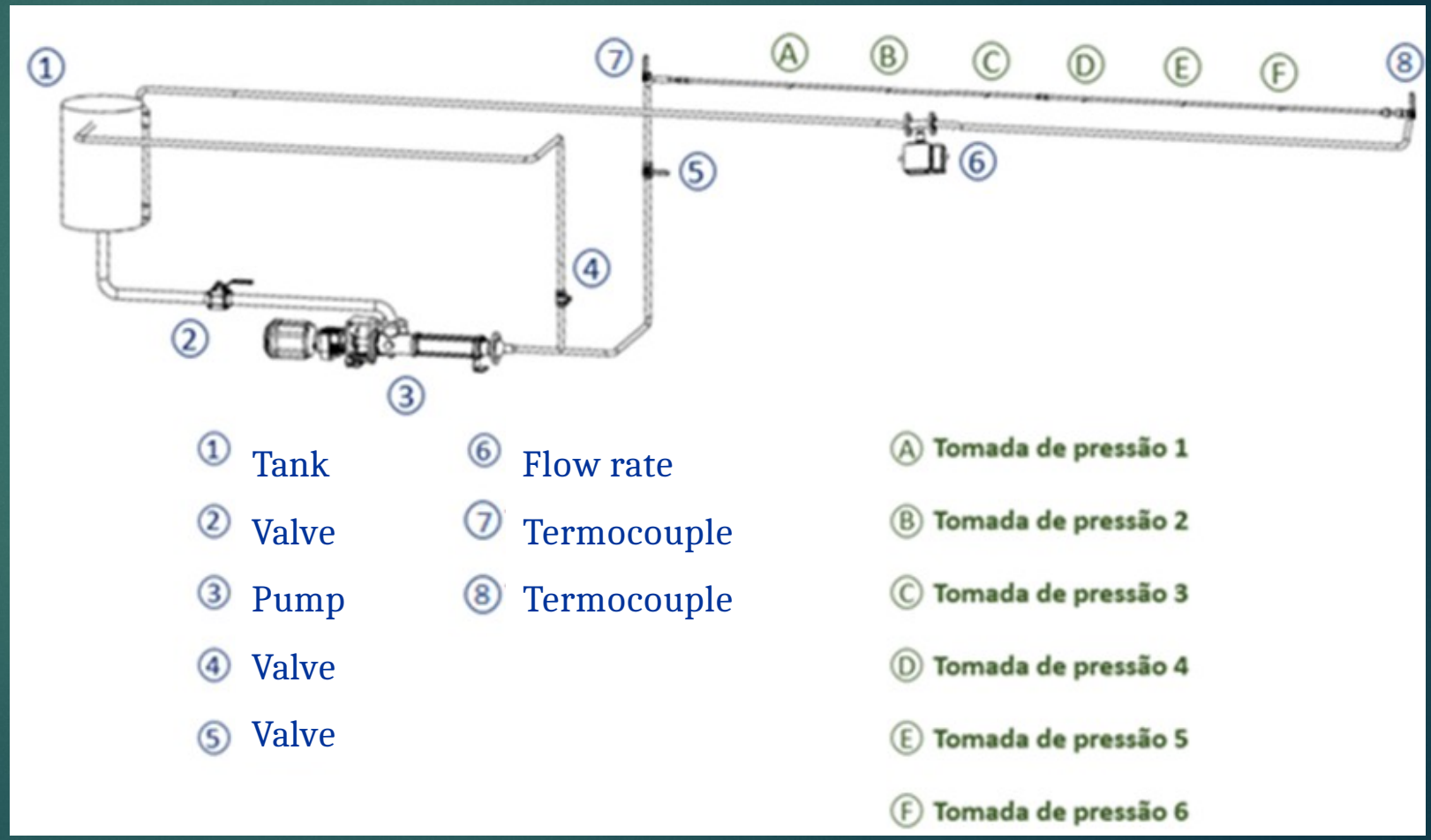
Smooth and roughness surfaces for water with polymer



- Roughness pipe B
- Polymer – CMC – concentration 0,1%
- The fluid rheology was monitored
- The influence of the temperature was verify and the temperature was monitored

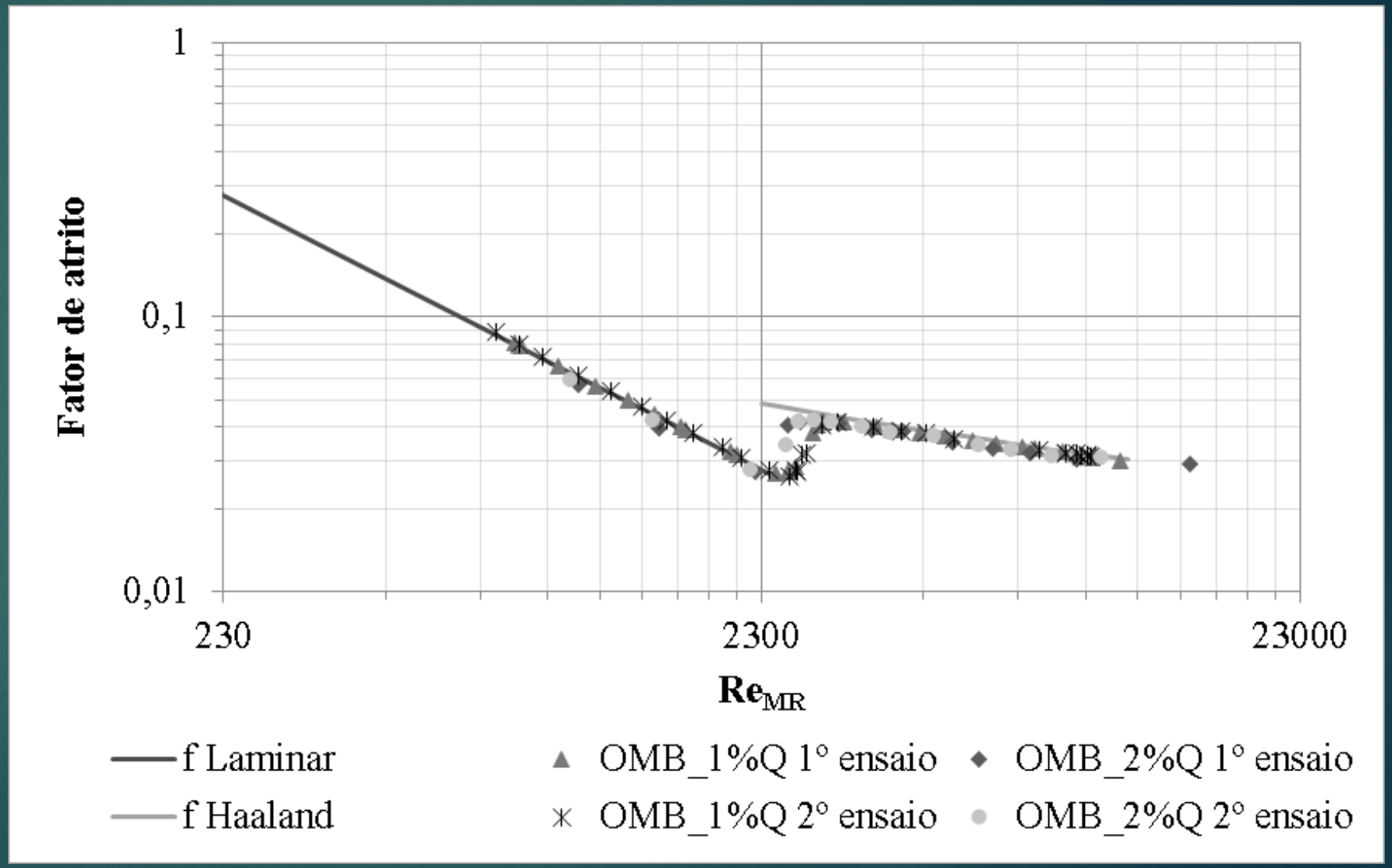
Study of the effect of the polymer in oil

- Acrylic Pipe
  - Smooth pipe
  - Approx. 6 meters
  - Tank 70 liters
  - Two polymers
    - Difference is molar mass (1g/mol – 4g/mol)



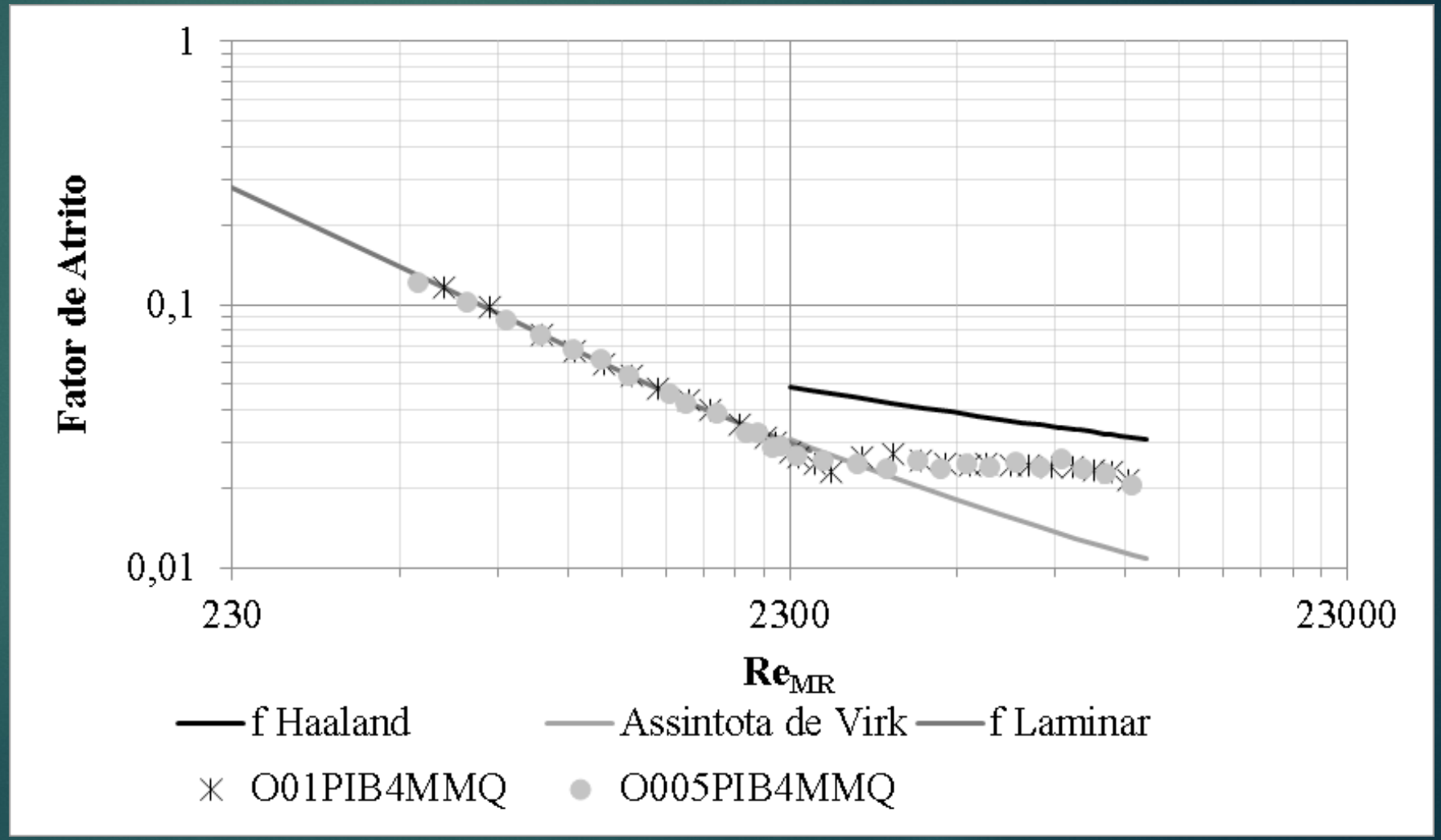
Study of the effect of the polymer in oil

- Friction factor for oil with solvent
- Two concentration of solvent
- The rheology is verified and monitored
- Temperature is monitored, and verified.



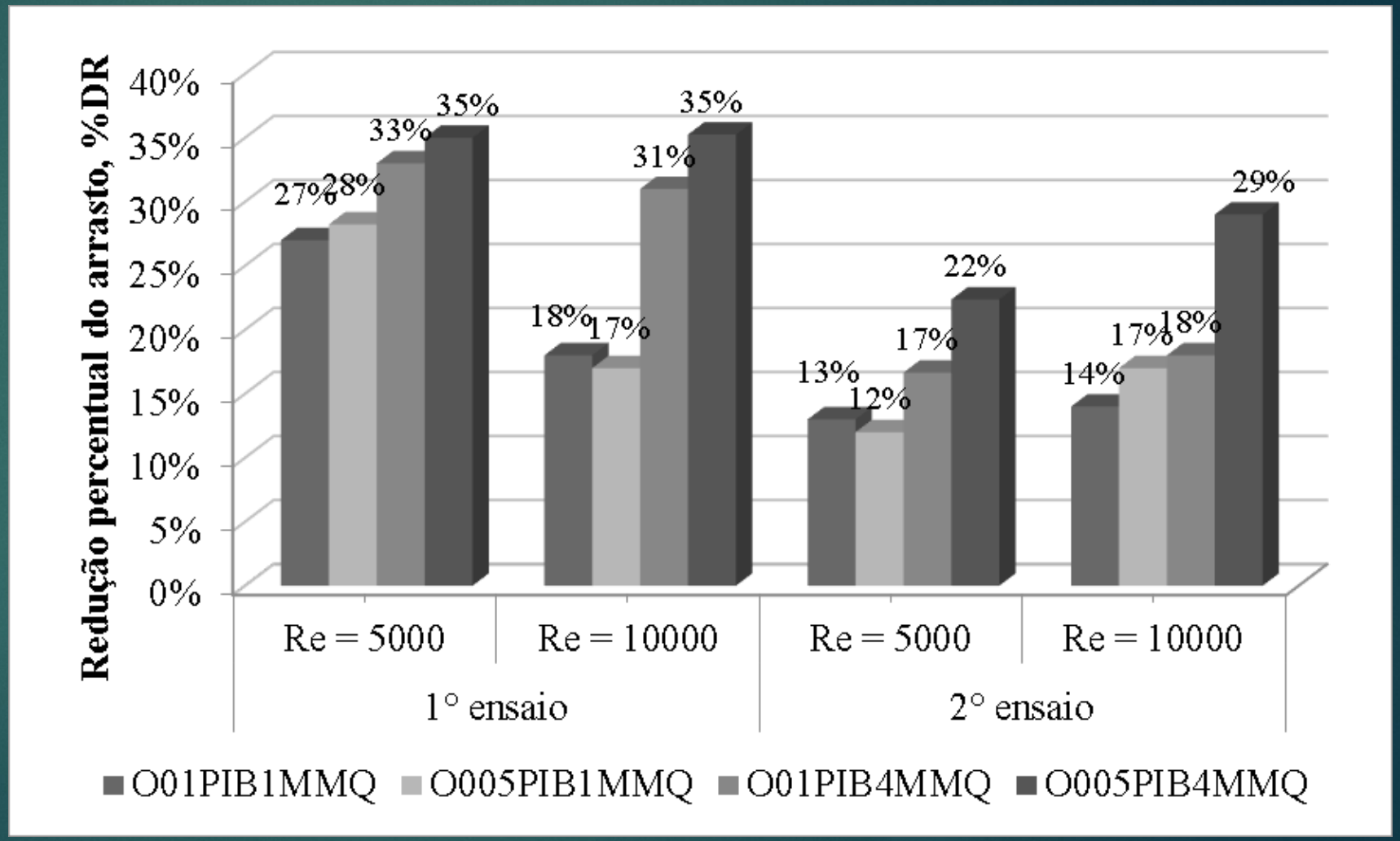
Study of the effect of the polymer in oil

- Friction factor for oil with solvent
- Polymer is PIB in two concentration
- The rheology is verified and monitored
- Temperature is monitored, and verified.



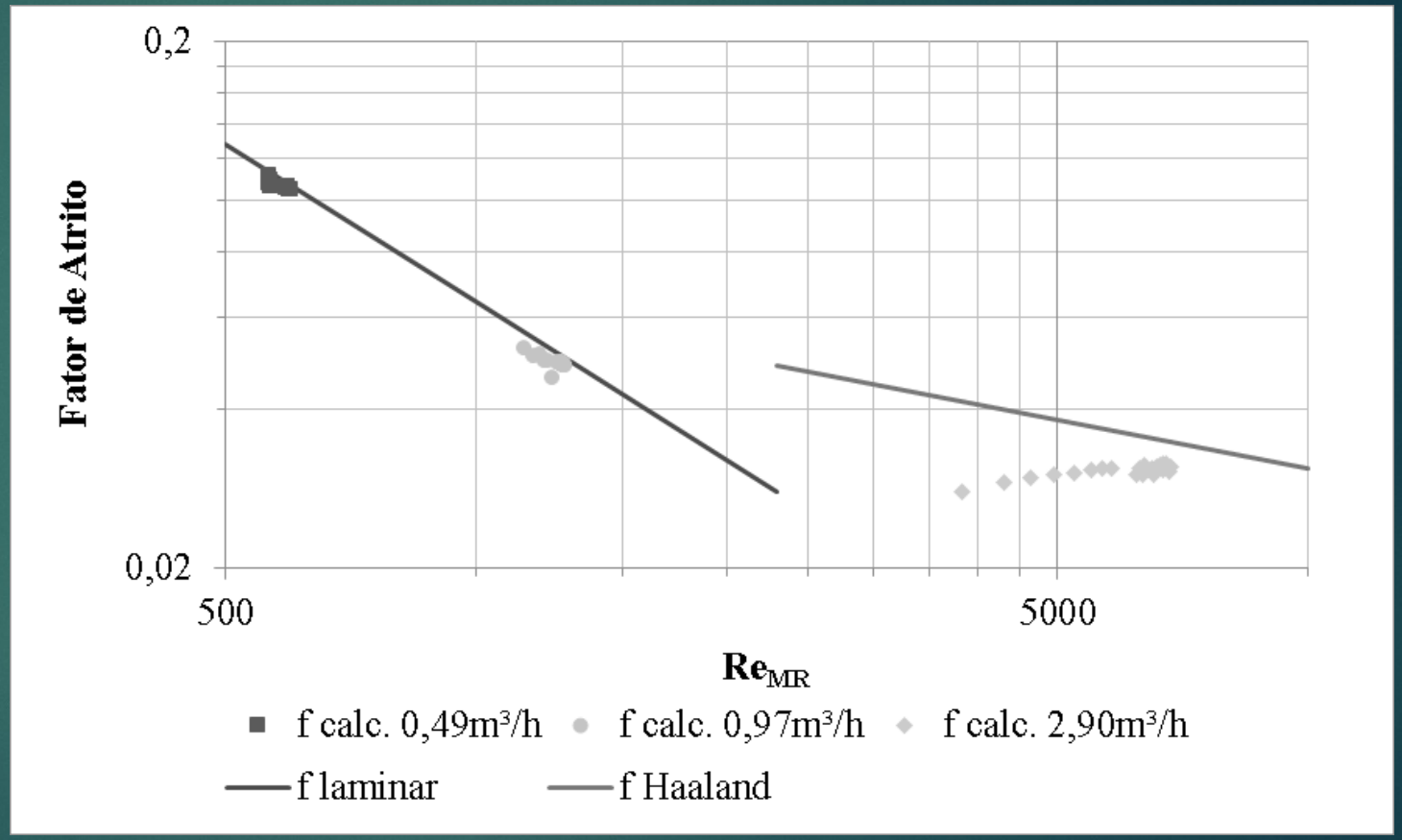
Study of the effect of the polymer in oil

- Friction factor for oil with solvent
- Polymer is PIB in two concentration
- The rheology is verified and monitored
- Temperature is monitored, and verified.
- Degradation is observed when we increase Reynolds numbers



Study of the effect of the polymer in oil

- Degradation in turbulent flow
- Test is to monitor pressure drop over time
- We can see that in turbulent region the degradation is instantaneous



Biphase flow (liquid-gas)

- Equipment
- Acrylic Pipe: 44,2mm ID (b)
  - 12m lenght
- Reservoir of 1m³ with agitator (a)
- Air compressor
- Pump (c)

Study of the effect of the polymer in biphase flow (liquid-gas)

- Degradation in turbulent flow
- Test is to monitor pressure drop over time
- We can see that in turbulent region the degradation is instantaneous

Capacit install

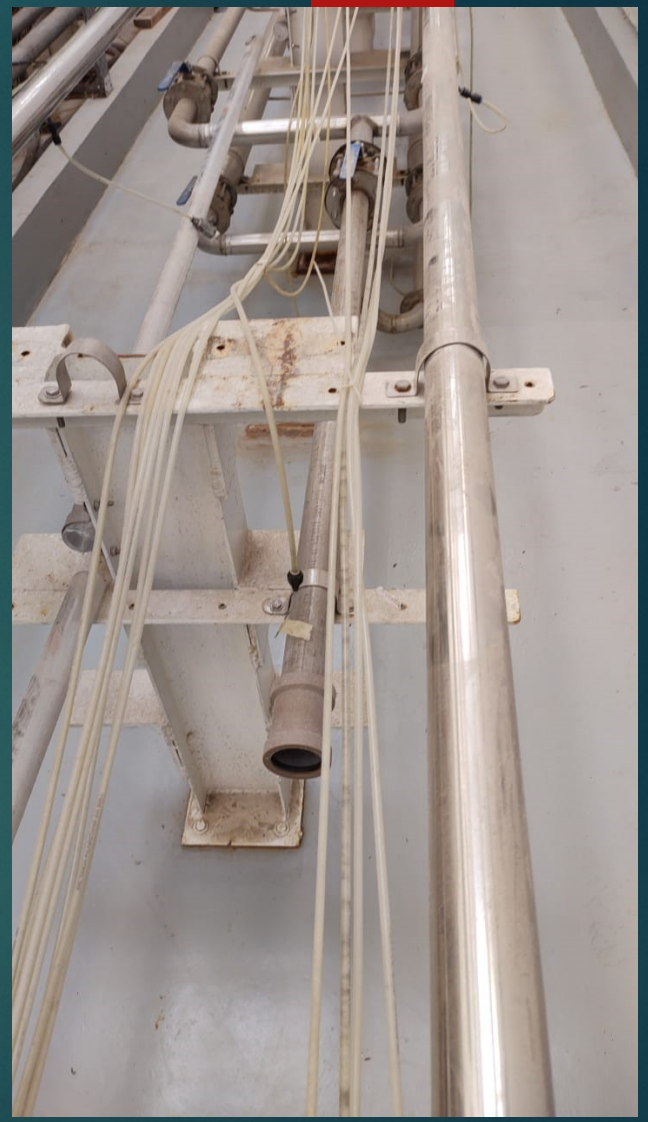
- Steel pipe, with +/- 30m of length
- Pump of the 20 and 40 m^3/h
- Electromagnetic flow rate (check)
- Differential and absolute pression gate
- Manometer
- Gas flow rate type vortex (Check)

ESTER Aparatus

- Steel pipe, with +/- 30m of length
- Pump of the 20 and 40 m^3/h
- Electromagnetic flow rate (check)
- Differential and absolute pression gate
- Manometer
- Gas flow rate type vortex (Check)

Fisic Area

- What we have to do...
  - First - we have to clean the area of the experiment because it is uninhabitable..
  - To buy crystal pipes for pression dot



Experimental aparatus

- What we have to do...
  - We have 4 resistive sensors of gas fraction.
  - Close the pipe.. Because two sensors was removed of the RIG. (guess who...? rsrsrs)

Fisic Area

- We need buy a new computer because what we had is not working.
- I prefer to buy a notebook, the price is the same and more easy to save.

Fisic Area

- What we have to do...
  - We need to buy / or to do a new acrylic/glass section for to view flow pattern.
  - Install the system of the data acquisition that isn’t work.

Fisic Area

- What we have...
  - Three Tanks of the 1000l
  - One tank is full of oil and we have discard this oil correctly.
- I suggest to change one tank for one of 4000l. Because the suction region of pump is not influenced for the return of fluid of the pipe. Principally when we have with biphasic flow, and we need separated the phases before of the pump suction.

Experimental Aparatus

Pictures of the aparatus

What we can mesuriment

- Liquid and gas flow rate
  - Velocity
  - Reynolds
  - Friction factor
- Slug sensor
  - Frequency bubble/slug
  - Velocity slug
  - Bubble length
  - Piston length
- Pressure drop
  - Friction factor
- Viewer flow pattern
  - Flow pattern map