

Odredjivanje protoka kroz cev merenjem dve Π - kote

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Energetska j-na izmedju pres. 1 i 2

- $E_1 = E_2 + \Delta E \Rightarrow \Pi_1 + v_1 / (2g) = \Pi_2 + v_2 / (2g) + \Delta E$
- $v_1 = v_2 = v \Rightarrow \Pi_1 - \Pi_2 = \Delta E = \lambda L / d \cdot v / (2g) \Rightarrow v \Rightarrow Q_{MER} = vA$

Volumetrijska metoda merenja protoka

- $Q_{TAC} = \Delta V / \Delta t = \Delta M / (\rho \Delta t)$

Mereno je

- Masa ΔM
- Vreme Δt
- $\square$ kote $\Pi 1$ i $\Pi 2$
- Temperatura

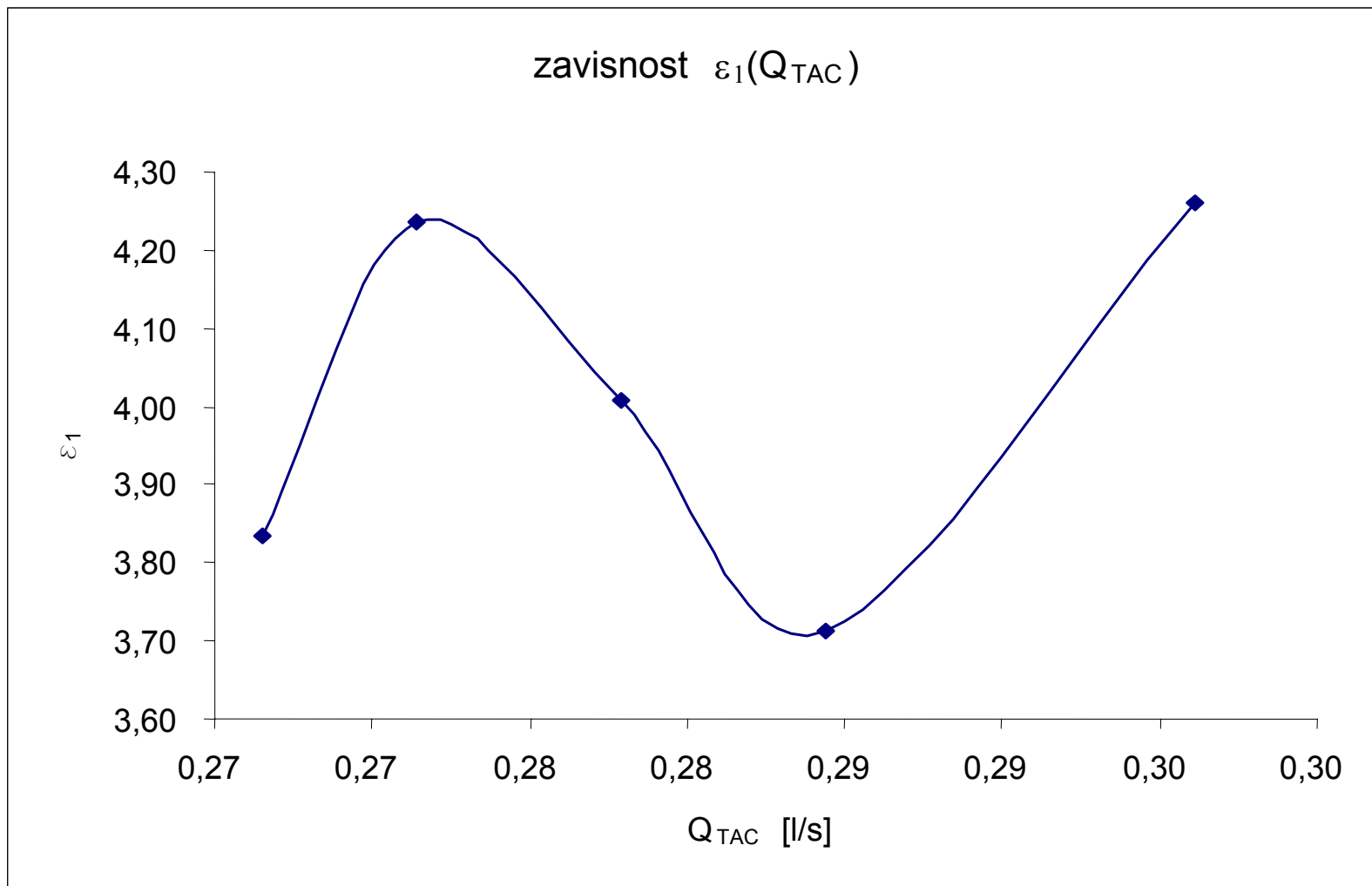
CILJ

- Odredjivanje Q kroz cev pomocu Π —kote i uporedjivanje sa tacnom vrednoscu

Izracunato

- Q_{TAC}
- Q_{MER}
- Greske merenja ε_1 i ε_2

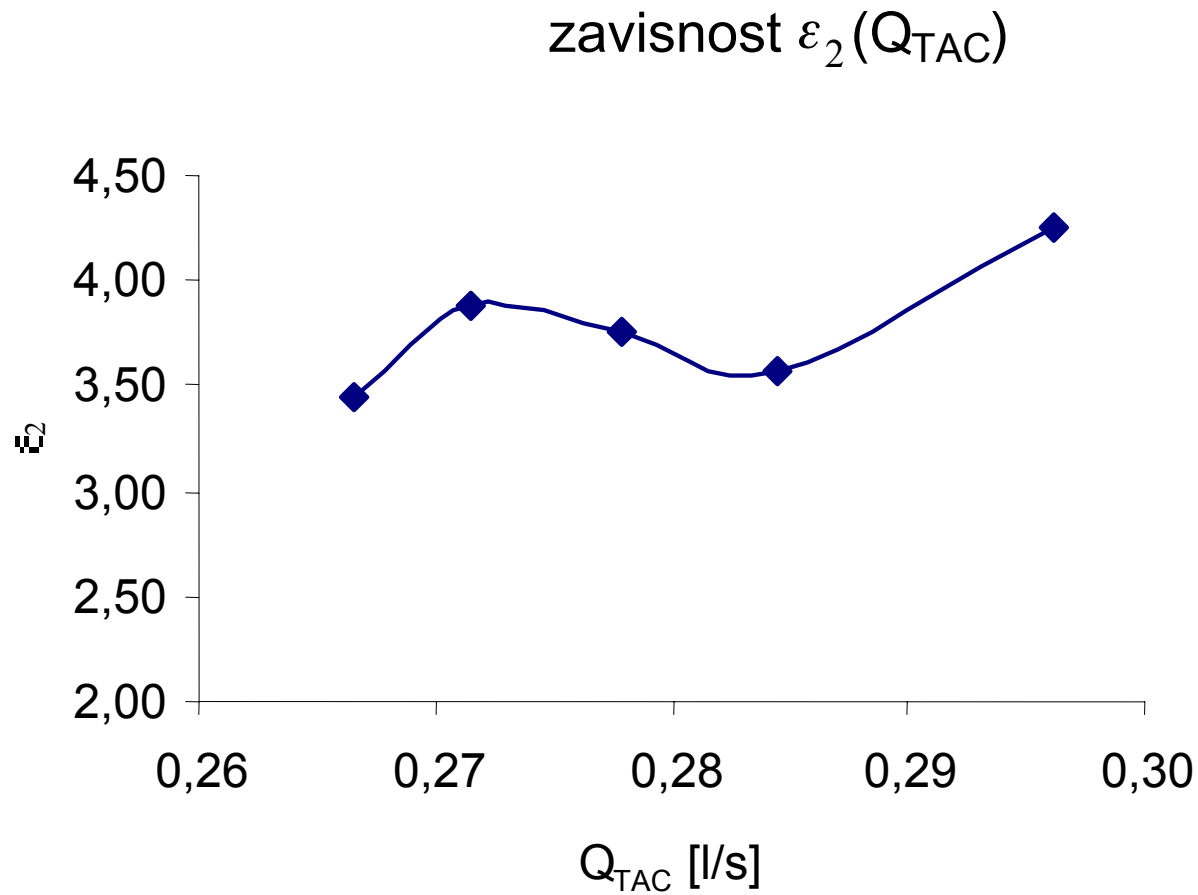
Zavisnost $\varepsilon_1 = \varepsilon_1 (Q_{TAC})$



Proracun greske merenja

$$\square \varepsilon_1 = \left(Q_{\text{MER}} - Q_{\text{TAC}} \right) / Q_{\text{TAC}} 100 [\%]$$

Zavisnost $\varepsilon_2 = \varepsilon_2(Q_{\text{TAC}})$



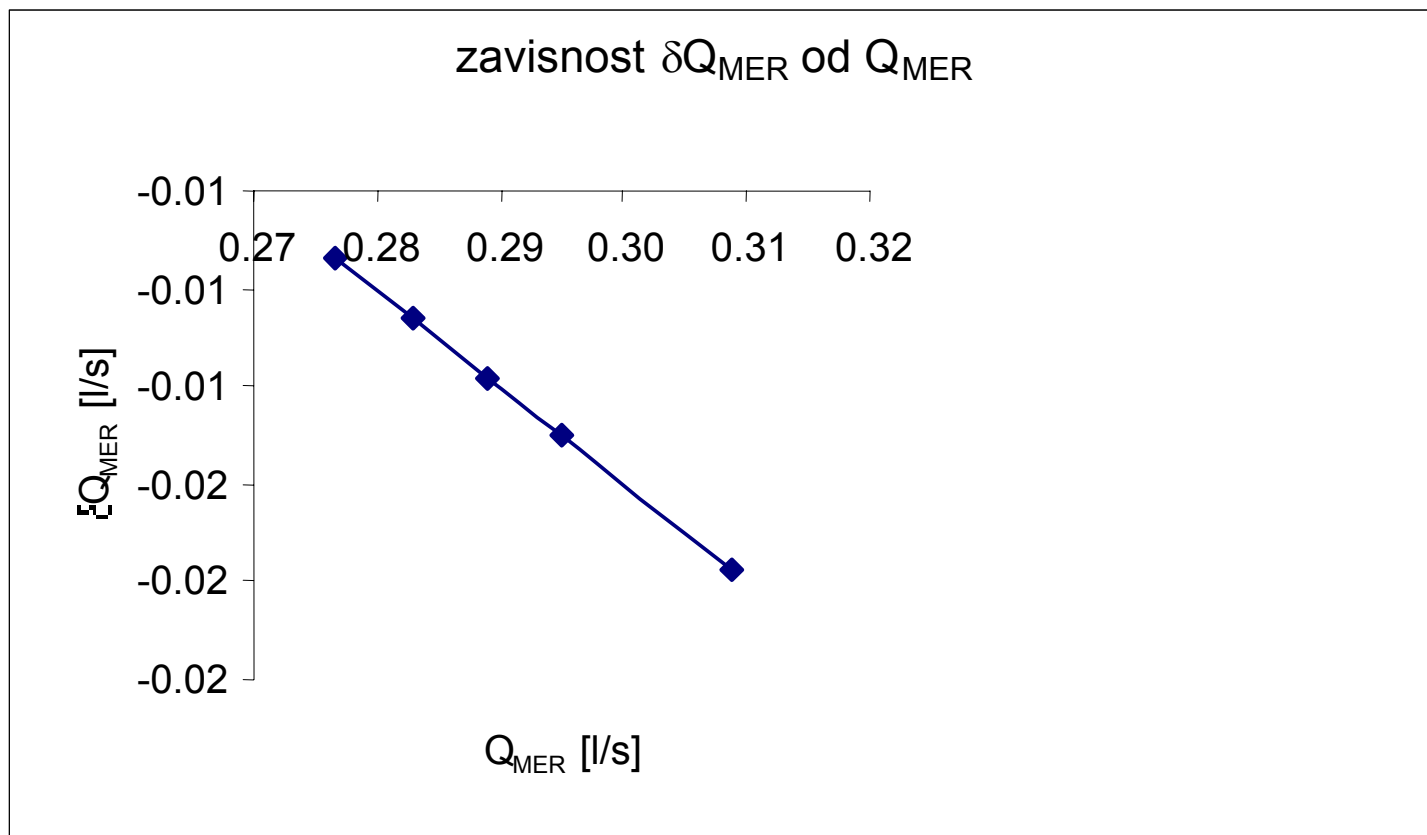
Proracun greske merenja

- $\varepsilon_2 = (Q_{\text{MER}} - Q_{\text{TAC}}) / Q_{\text{TACMAX}} 100 [\%]$

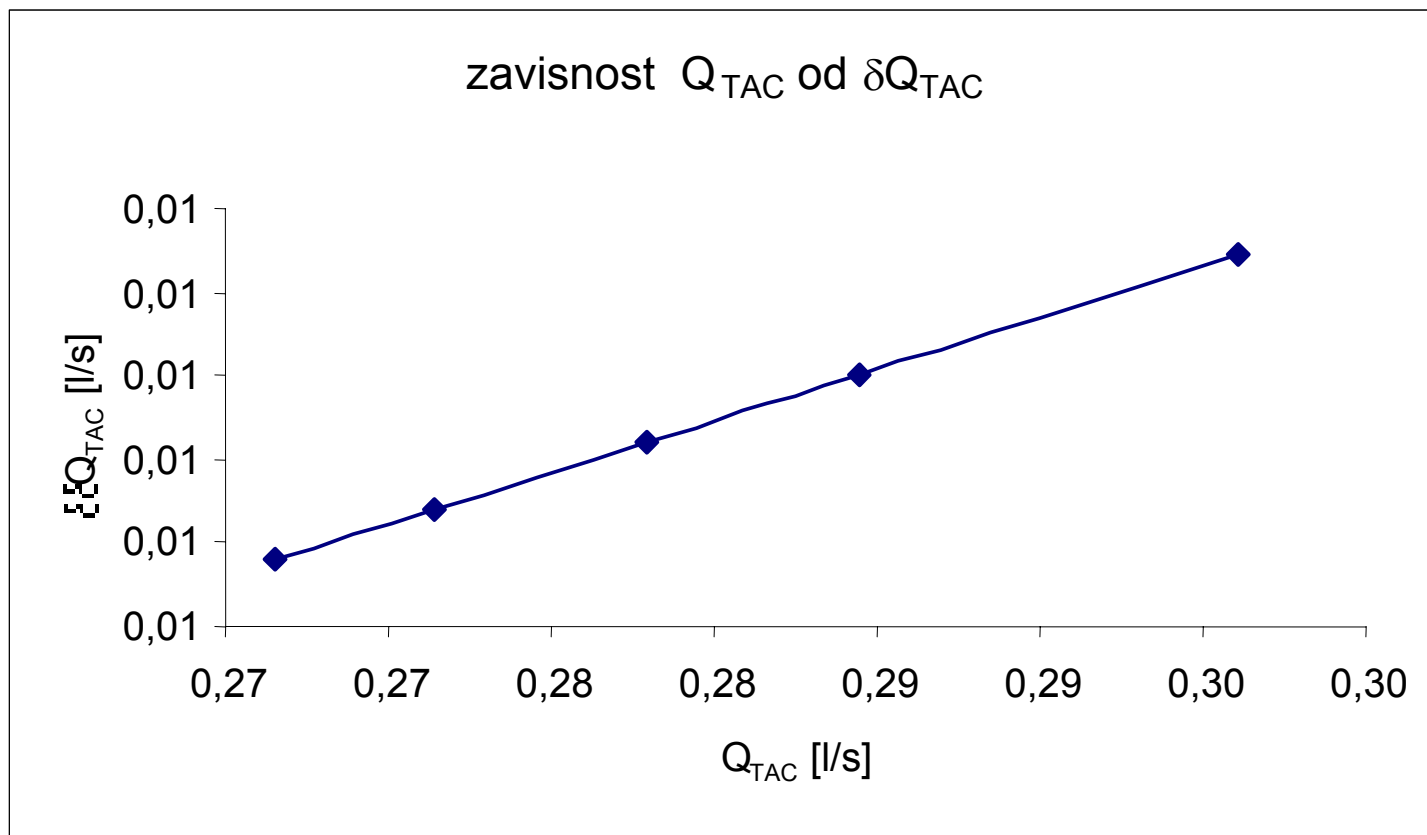
Apsolutna neodredjenost za izmereni protok

$$\square \delta Q_{\text{mer}} = \delta Q_{\text{MER}} / \delta \lambda \quad \delta \lambda$$

Apsolutna neodredjenost za svaki izmereni protok



Apsolutna neodredjenost za tacni protok



Proracun neodredjenosti za Qtac

$$\begin{aligned} \delta Q_{TAC} = & \left(\frac{\partial Q_{TAC}}{\partial M} \right)^2 \delta M^2 + \left(\frac{\partial Q_{TAC}}{\partial t} \right)^2 \delta t^2 + \\ & + \left(\frac{\partial Q_{TAC}}{\partial \rho} \right)^2 \delta \rho^2 \end{aligned}$$

Hrapavost cevi

- $1/\sqrt{\lambda} = -2\log(k/(3.7D)) + 5.13^{0.89}/Re$