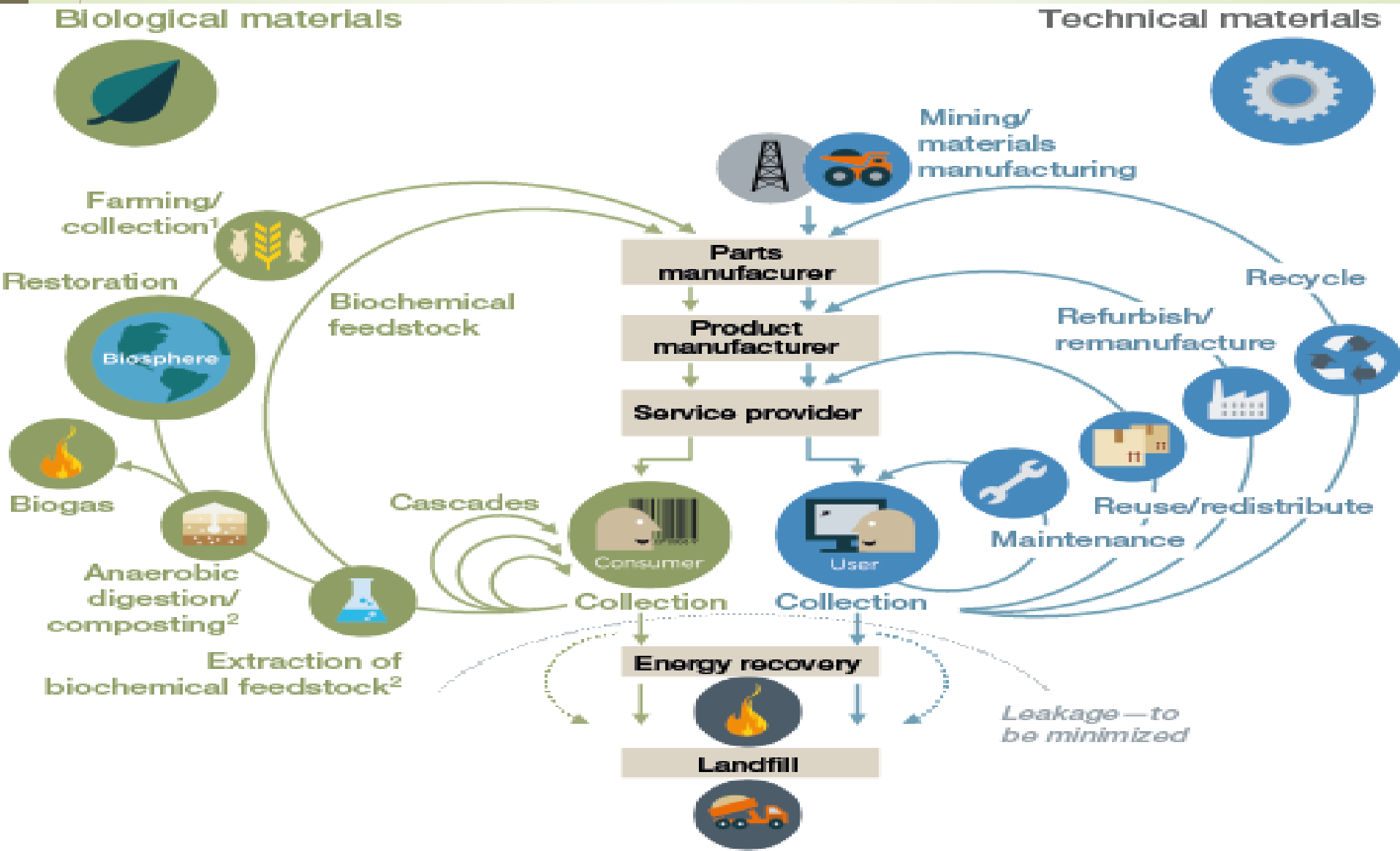


Dr. Bokányi Ljudmilla PhD, CSc Associate Professor  
(University of Miskolc) - GYÖRGY KRIZSÁN (DRV ZRt)

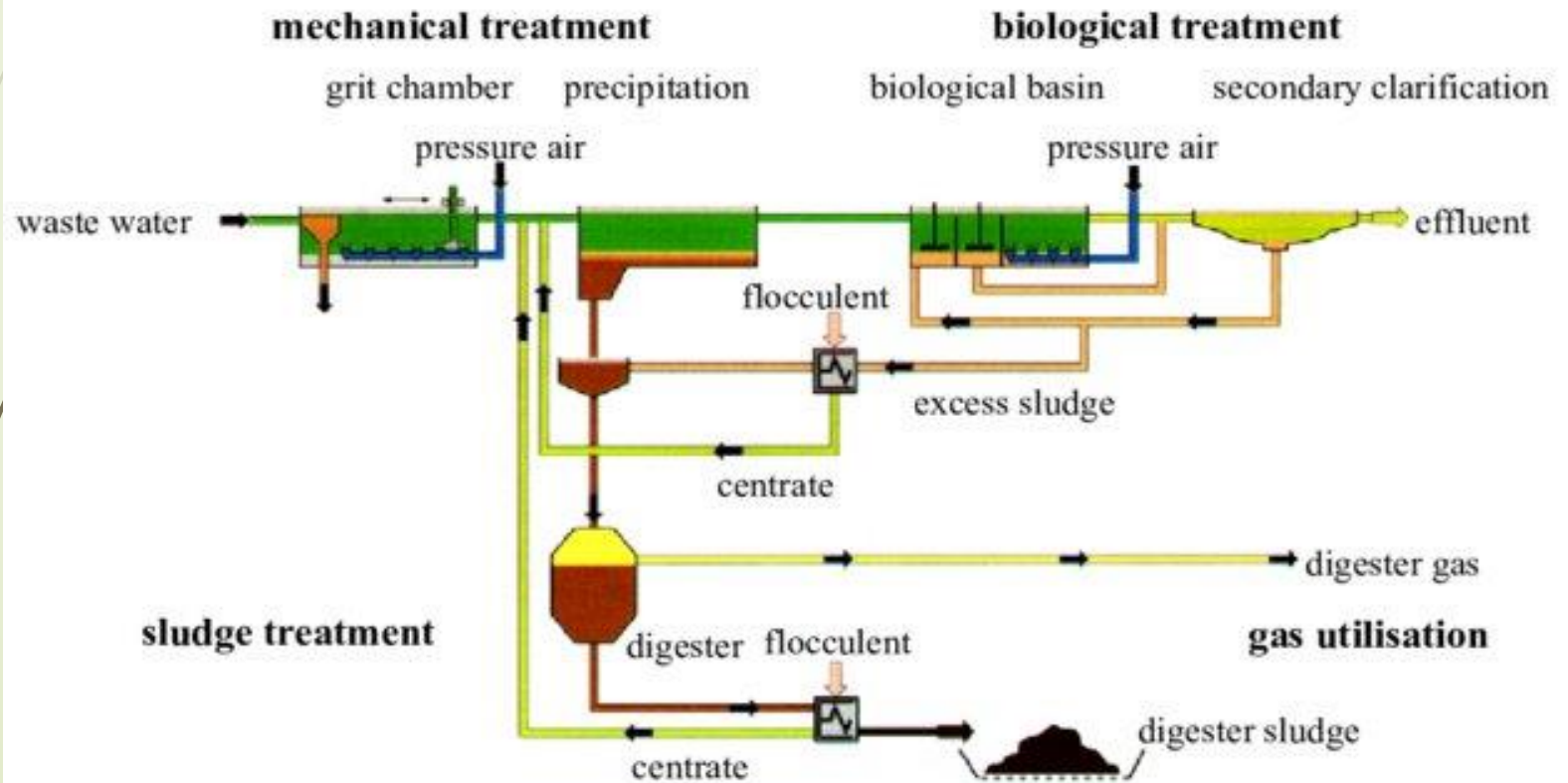
# **INNOVATIVE INTENSE AEROBIC TREATMENT OF SEWAGE SLUDGE in COMBINATION WITH ADSORPTION ON FOSSIL COAL**

*2022. Május 13. TEKH*

# CIRCULAR ECONOMY CONCEPT

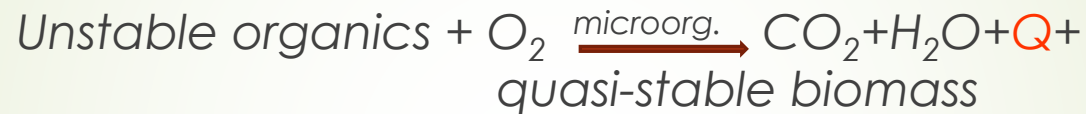


# ADVANCED MUNICIPAL WASTEWATER (three-stages)



# TWO BIOLOGICAL CONVERSIONS

## ➤ **Aerobic degradation:**



## ➤ **Anaerobic digestion (fermentation):**






# SEWAGE SLUDGE



- Low dry solids content and difficulty of de-watering
- Thermodynamically instable
- Consists of invaluable nutrients like C, N, P, K, as well as micro nutrients
- Global aim harmonising with the circular economy concept: to return into soil to fertilise
- Energetical recycling as Refuse Derived Fuel (RDF)
- Obstacles: difficult-to-degrade (refractory) organic compounds and other pollutants

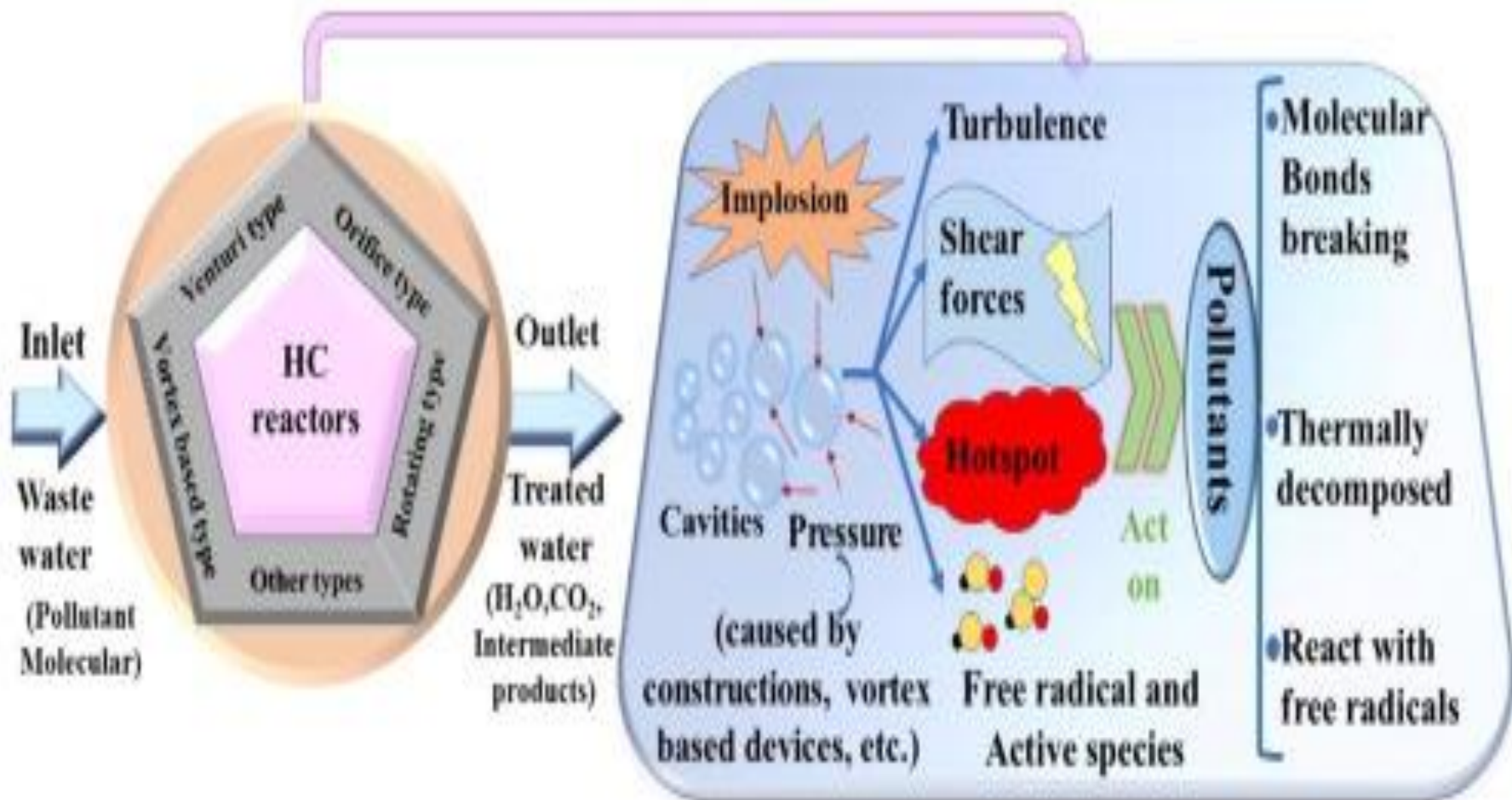


Necessity of the creation of a new approach to the sewage sludge treatment to convert it into value

- Combination of hydrodynamic cavitation with the adsorption for the intensive, fast additional aerobic degradation
- Added-value by adsorbent



## Inside the reactors



- Fragmentation of aggregates and water-inclusion aggregates.
- Oligomers forming and their further diffusion into aqueous phase.
- Growth of the contacting area.
- Growth of oxygen concentration and concentration gradient, so that of intensity of mass transfer.
- Fragmentation of microbial cells. Diffusion of free enzymes into aqueous phase, higher rate of enzyme-catalytic reactions.

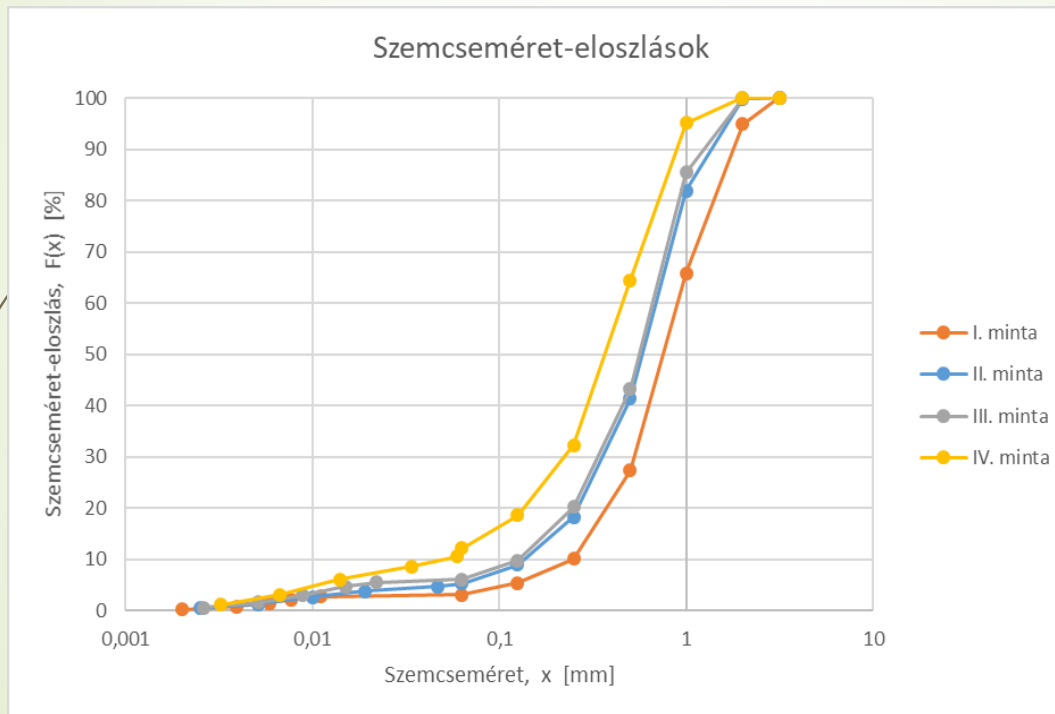




# Role of fossil coal adsorbent in the innovative process

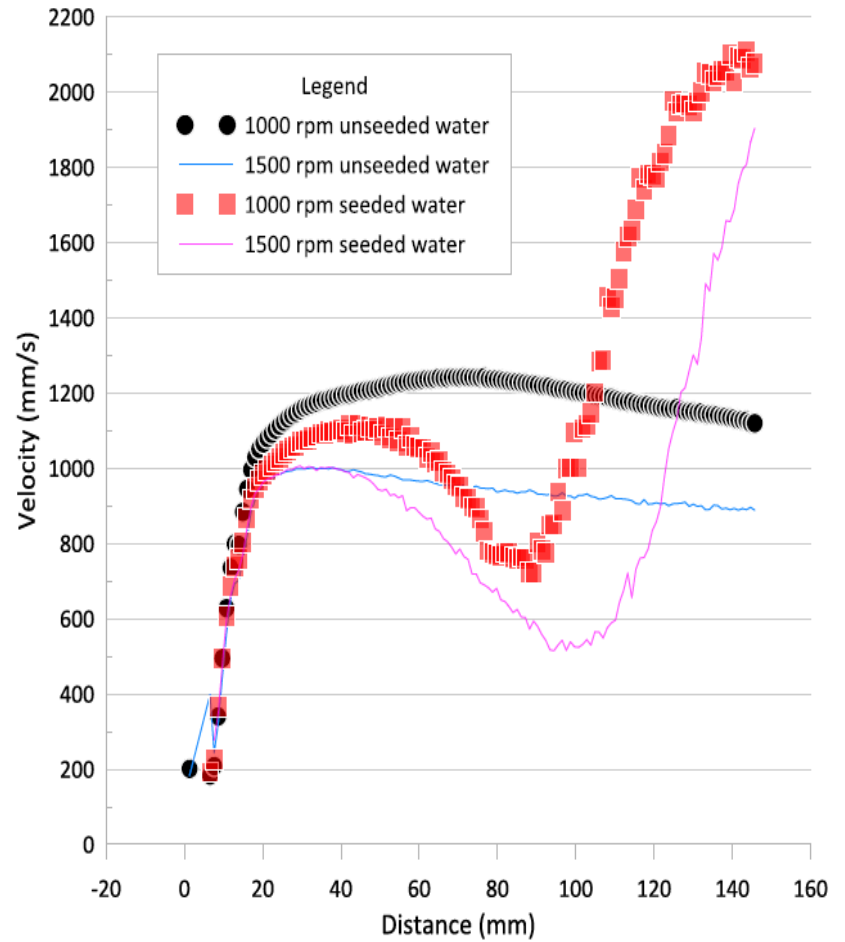
- Adsorption of the released species
- Due to fragmentation in the HDC treatment new surface and plenty of edges formation
- Due to the higher particle-particle-microbial cell collision probability, higher ruption probability of the microbial cell
- Due to its humic acids content, added value is provided for the treated sewage sludge.

# COAL DEGRADATION

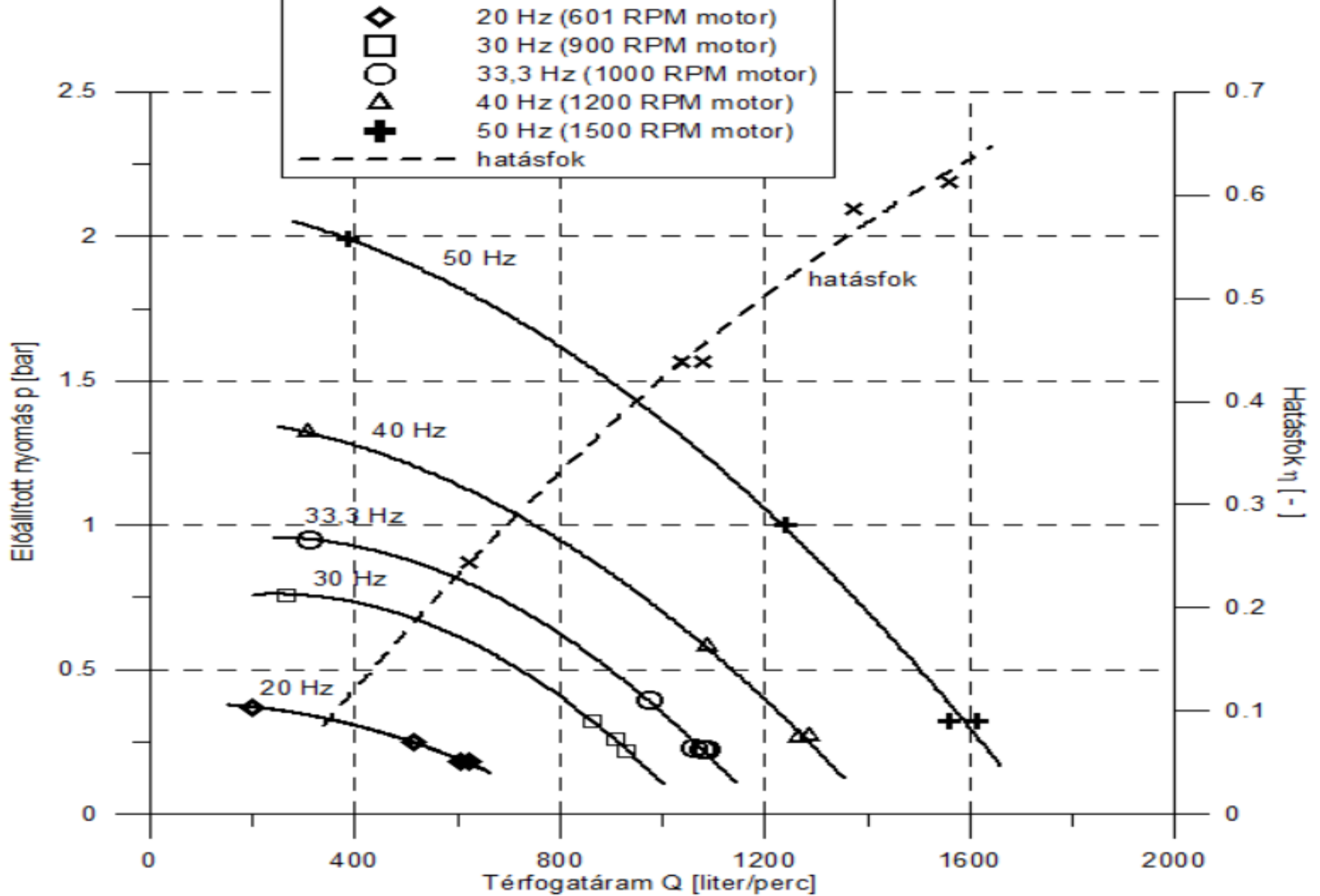


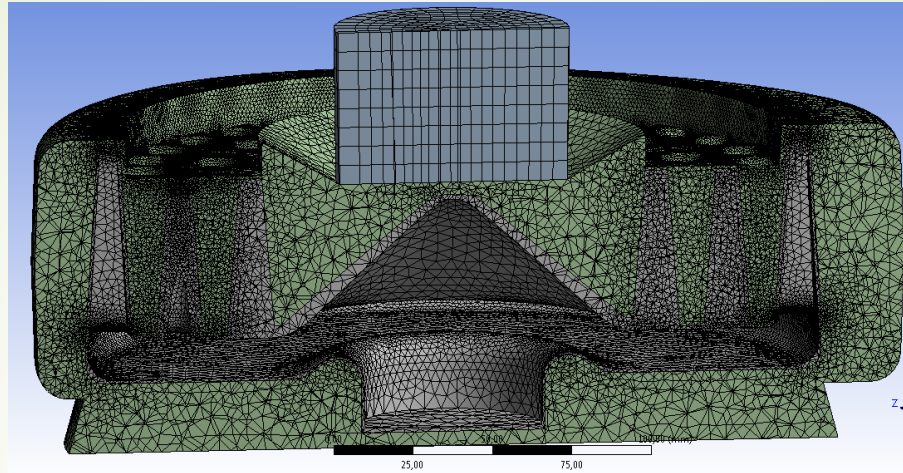


Velocity Profiles

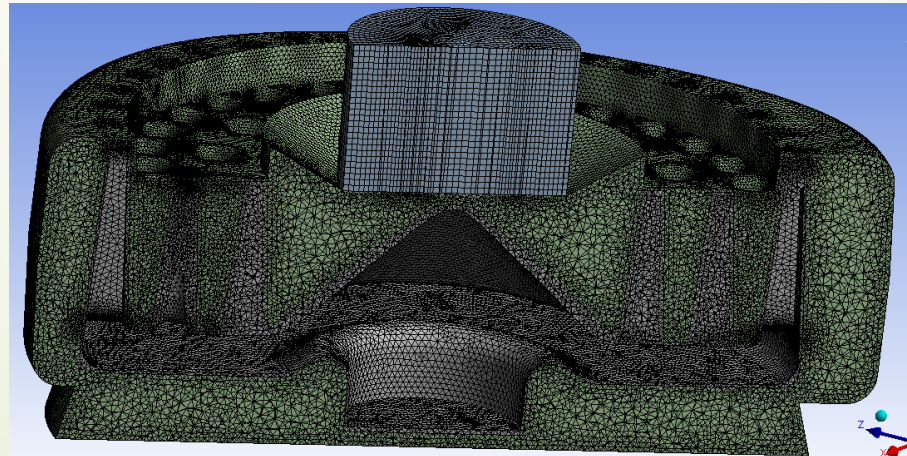


Kavitron jelleggörbék  
(2019. dec. 17. mérés alapján)

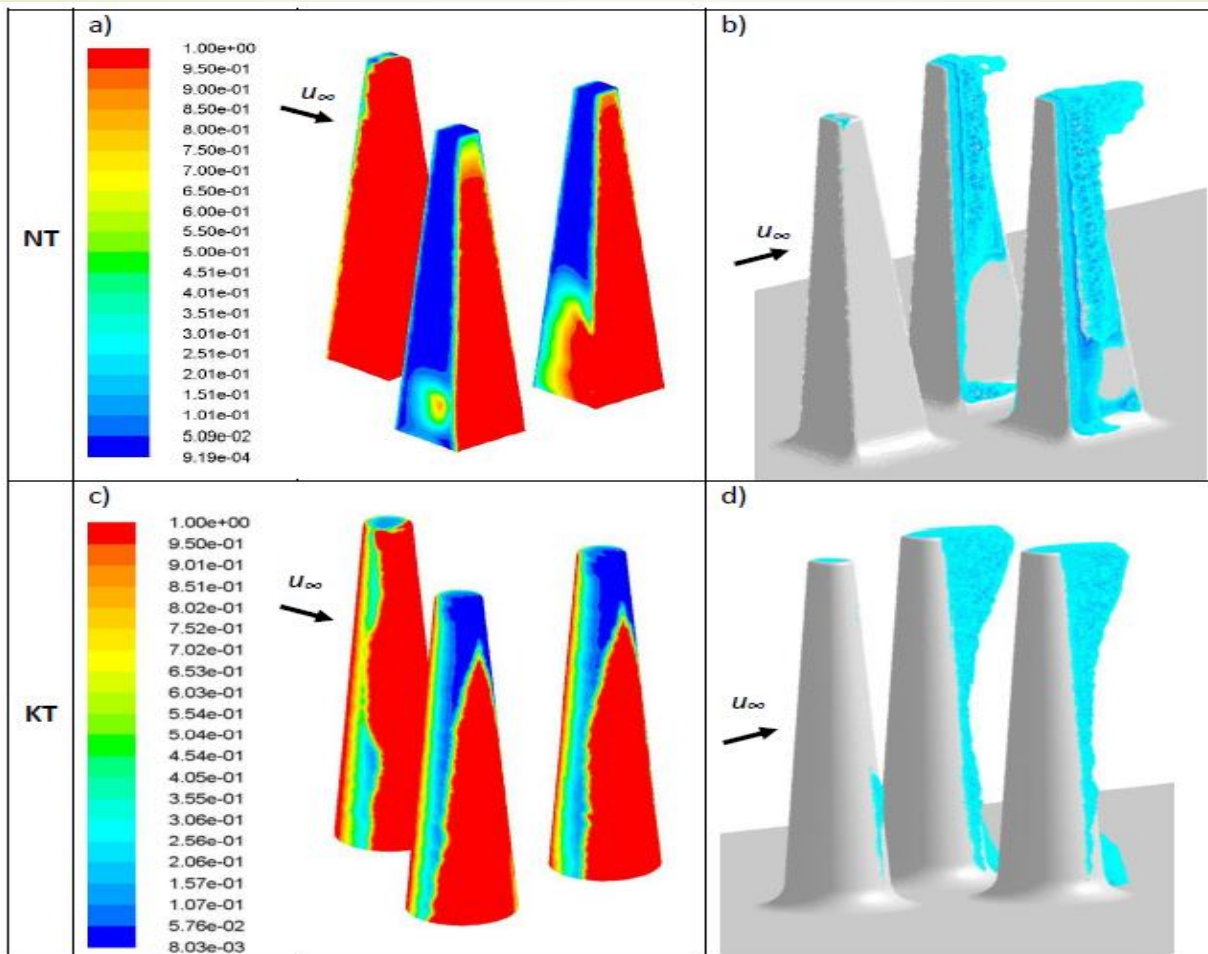




Hálókialakítás: (a) ritkább, (b) sűrűbb.



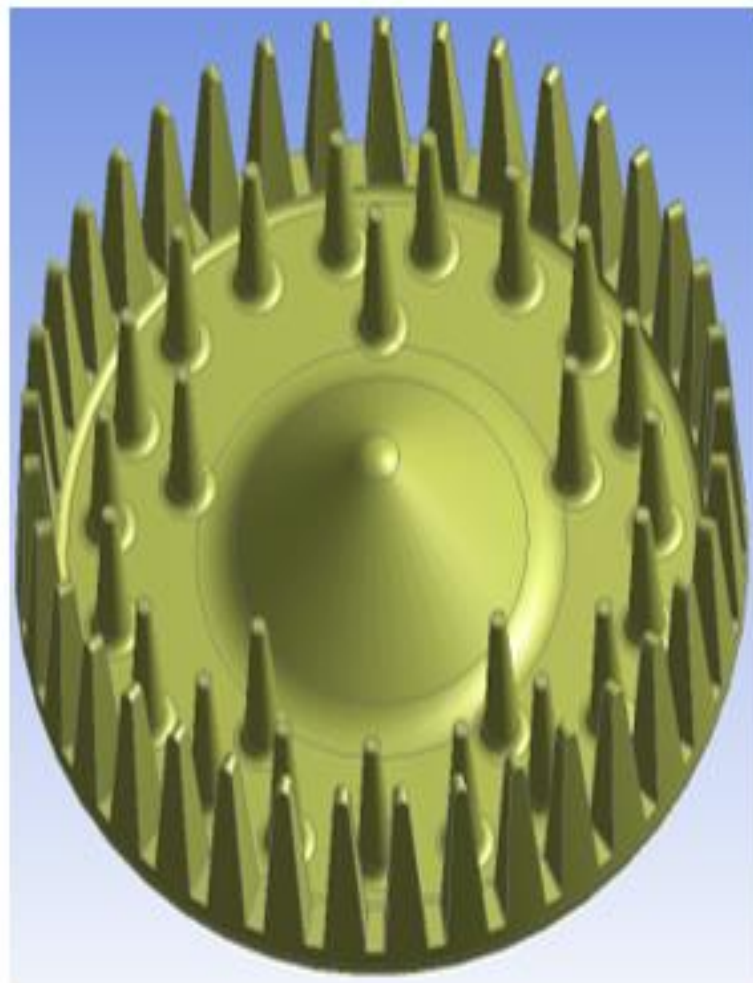




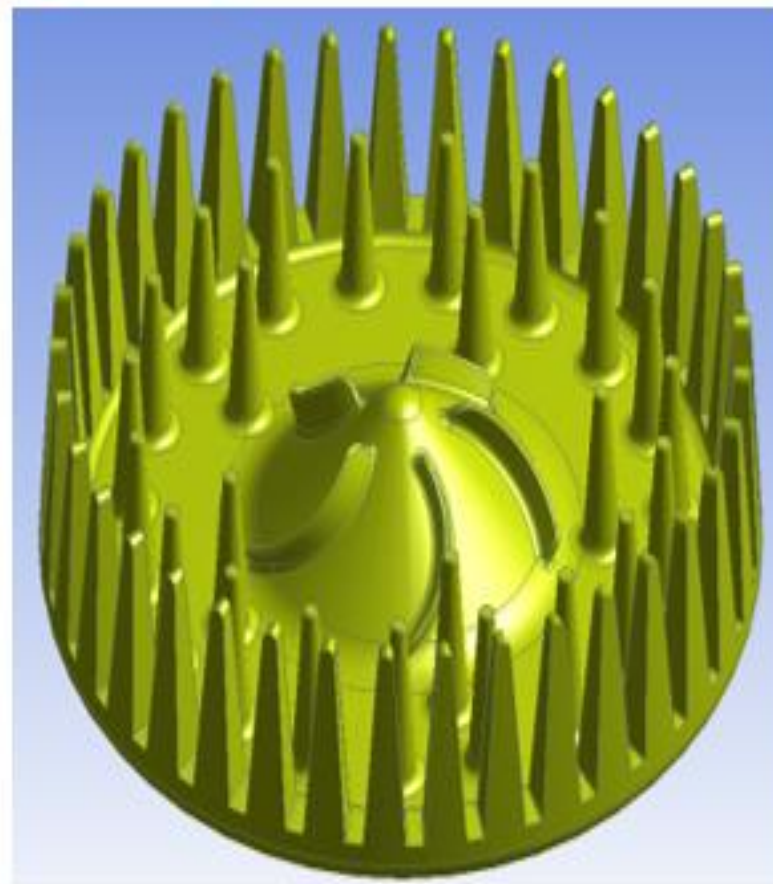
4.2.8 ábra Az A esetben a fázisoszlás a tuskéken a) NT és c) KT esetén, illetve túske környezetében egy ekvipotenciális felületen ( $u_{\infty} = 15$  m/s).



a) Eredeti forgó járókerék

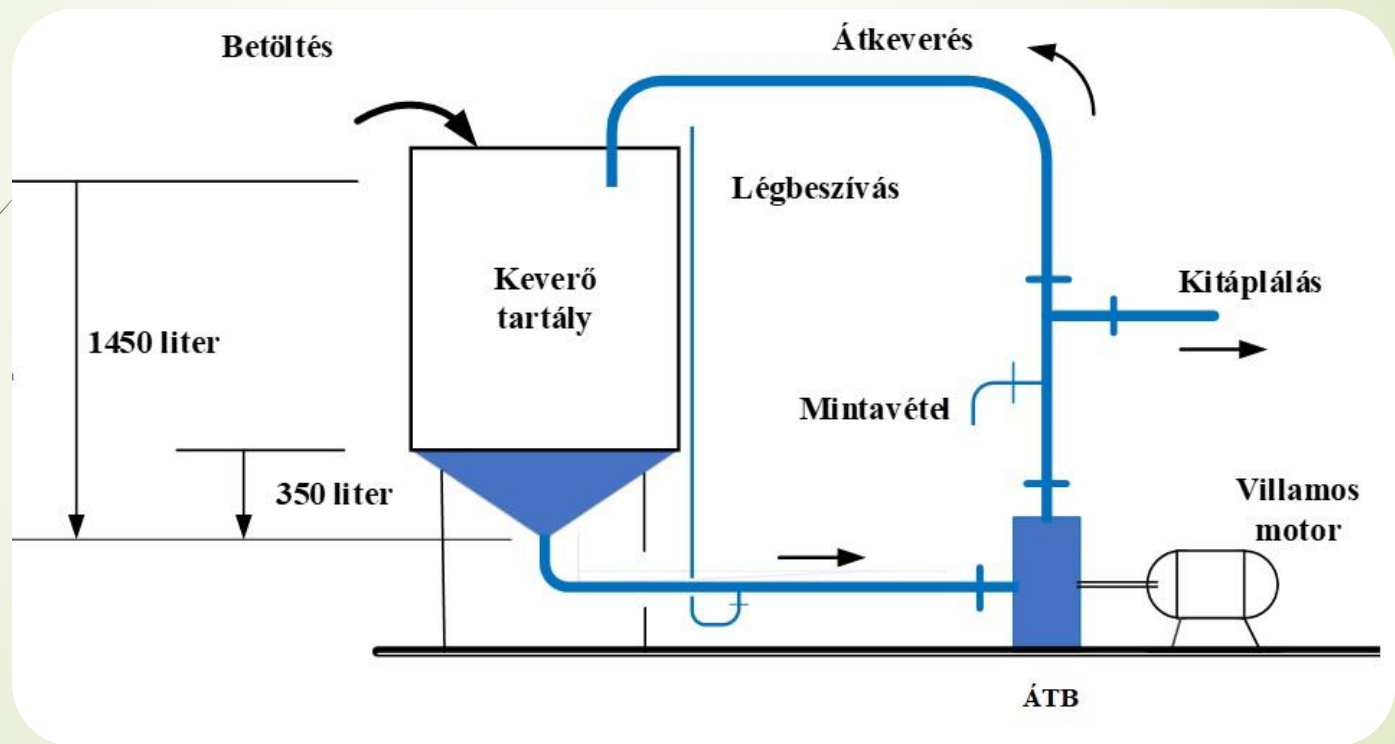


b) Lapátosított forgó járókerék



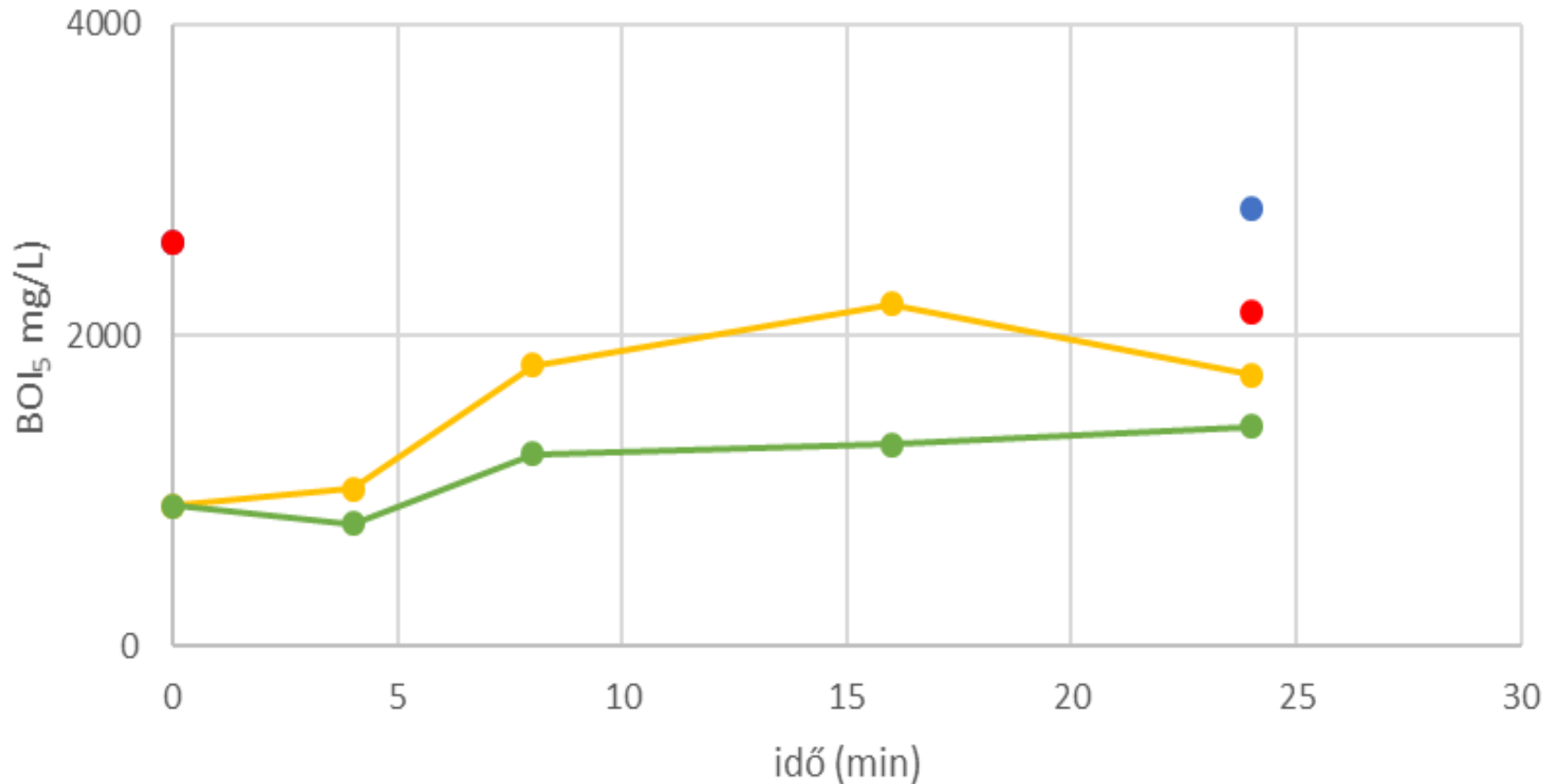
2.2 ábra A szivattyú (a) eredeti forgó járókereke, (b) a forgórészen kialakított lapátosítás.

# INDUSTRIAL TRIALS in SIÓFOK



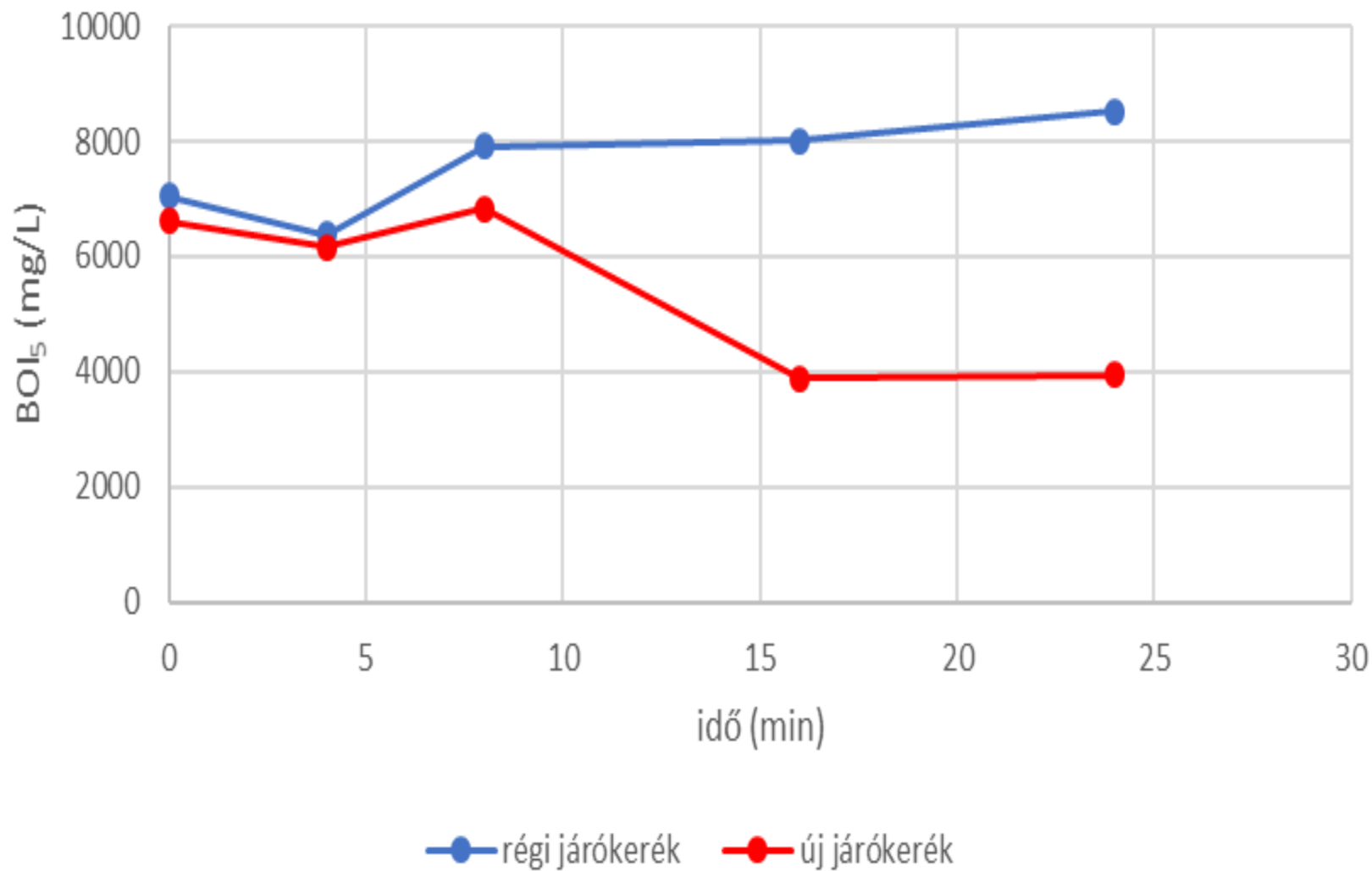
VLB

# Rothasztott iszappal, szén adalékanyaggal és anélkül végzett kísérletek során mért $BOI_5$ , $n=1400$ 1/min



- régi járókerék, adalékanyag nélkül
- régi járókerék, 5 m/m % szén
- új járókerék, adalékanyag nélkül
- új járókerék, 5 m/m % szén

# Kevert iszappal végzett kísérletek során mért $BOI_5$ , $n=1400$ 1/min





Thank you very much for  
your attention