

# ***THE PERFORMANCE OF RANDOM PACKING FOR HIGH PRESSURE SYSTEMS***

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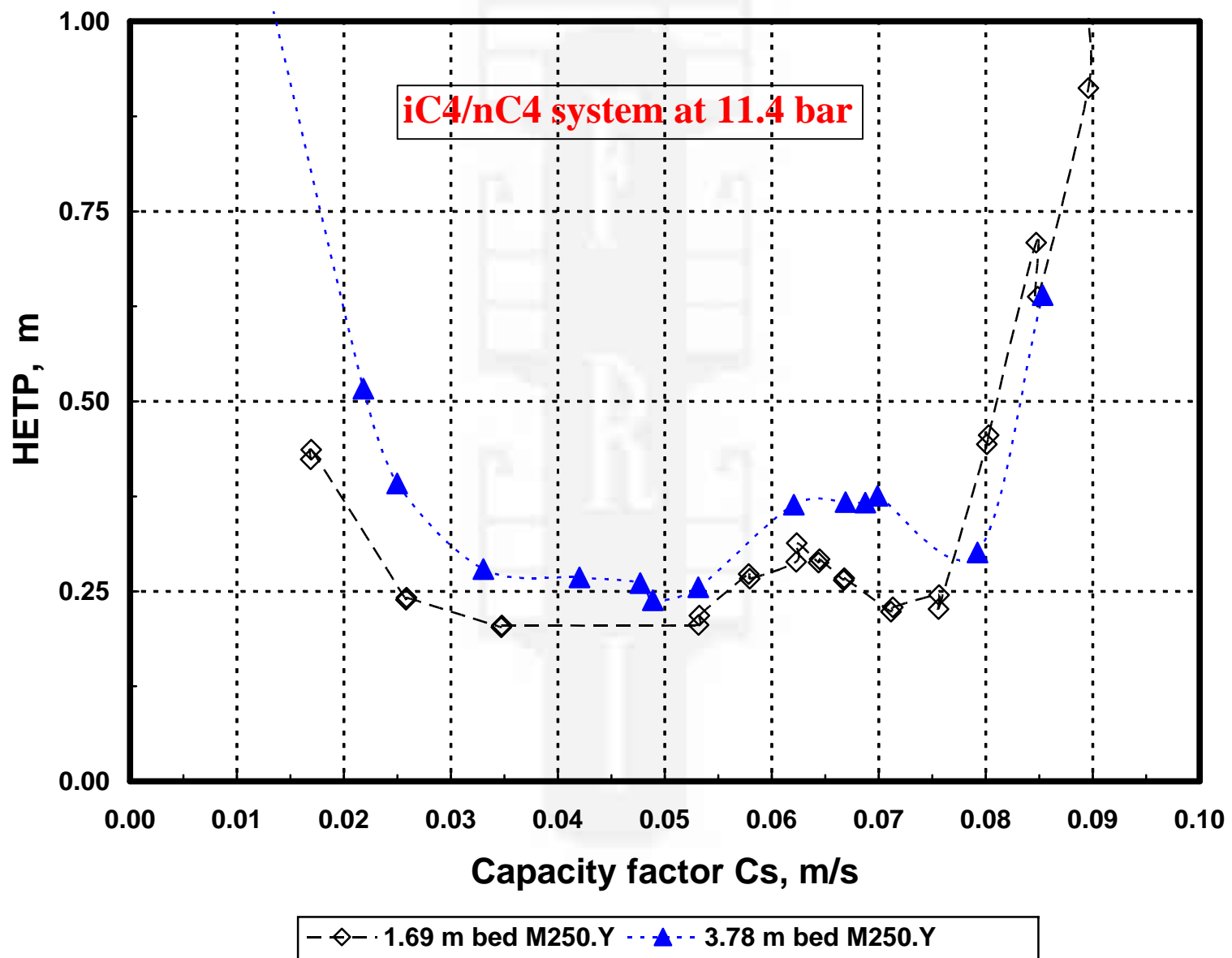


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# *Introduction*

- **For the structured packings, the HETP hump (deterioration of mass transfer performance in the 70 to 90 per cent of flood region) was found by FRI with the butane system at pressures in excess of 7 bar pressure**



# *Objectives*

- **To have better understanding of performances of the random packing with high pressure systems**
- **To understand the limits for random packing in high-pressure services**
- **To determine the effects of the distributor and/or sub-cooled reflux on the packing performances**

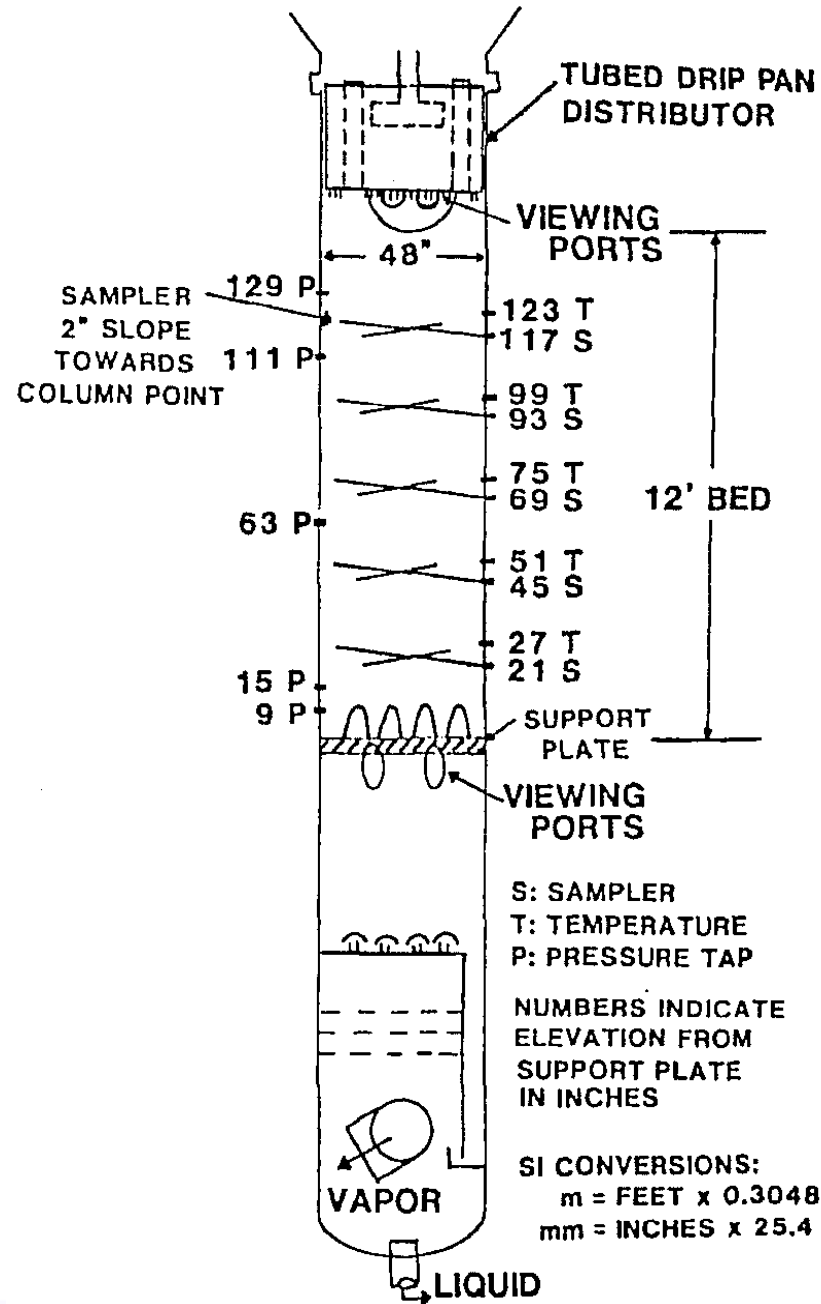
# *Test Outlines*

- **System**
  - **iC4/nC4**
- **Pressures**
  - **11.4, 20.4, 27.2 bars**

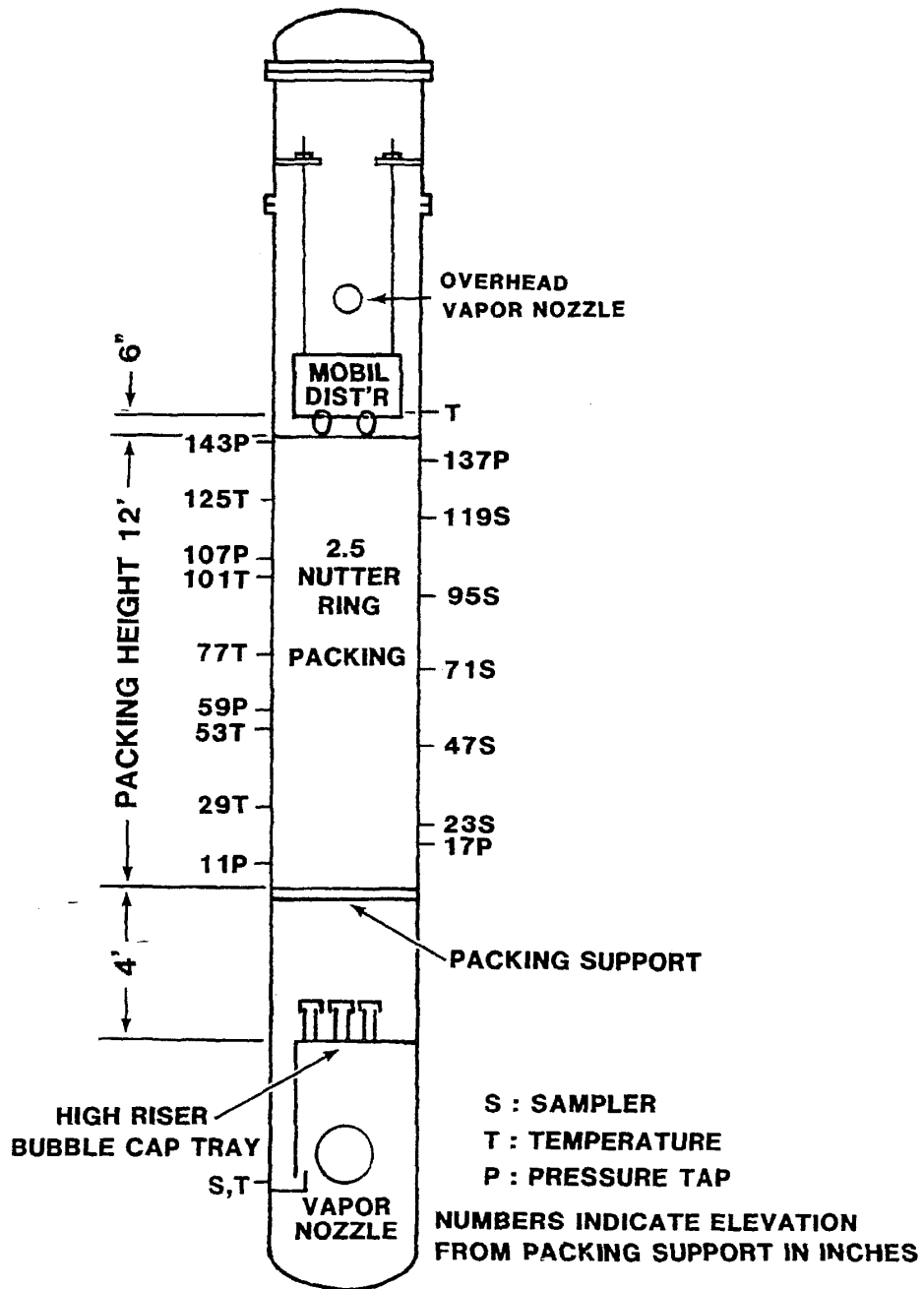
# *Experimental Setups*



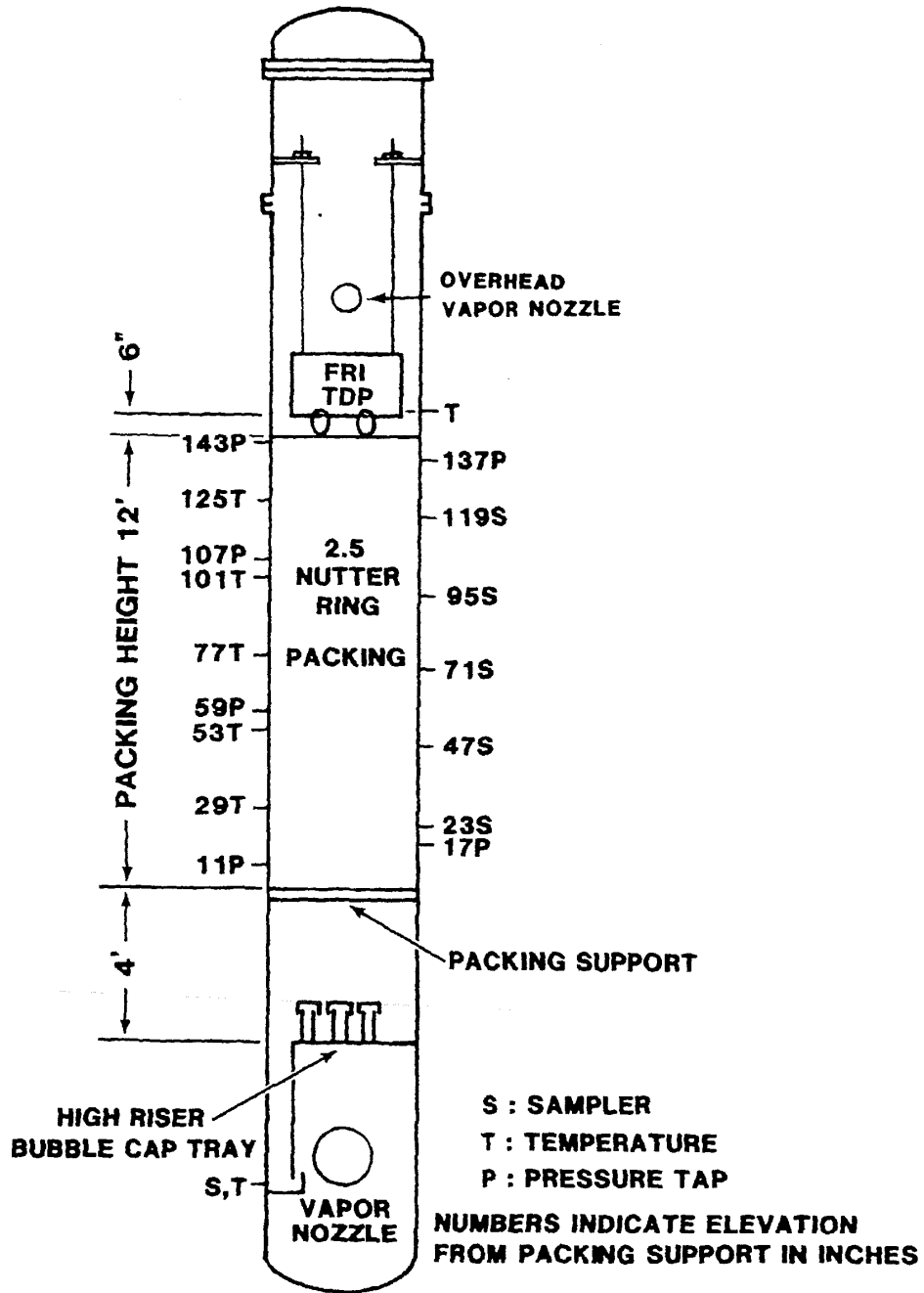
# 50 mm Fall Rings Setup with IDF Distributor



# No. 2.5 Nutter Rings Setup with Mobil Distributor



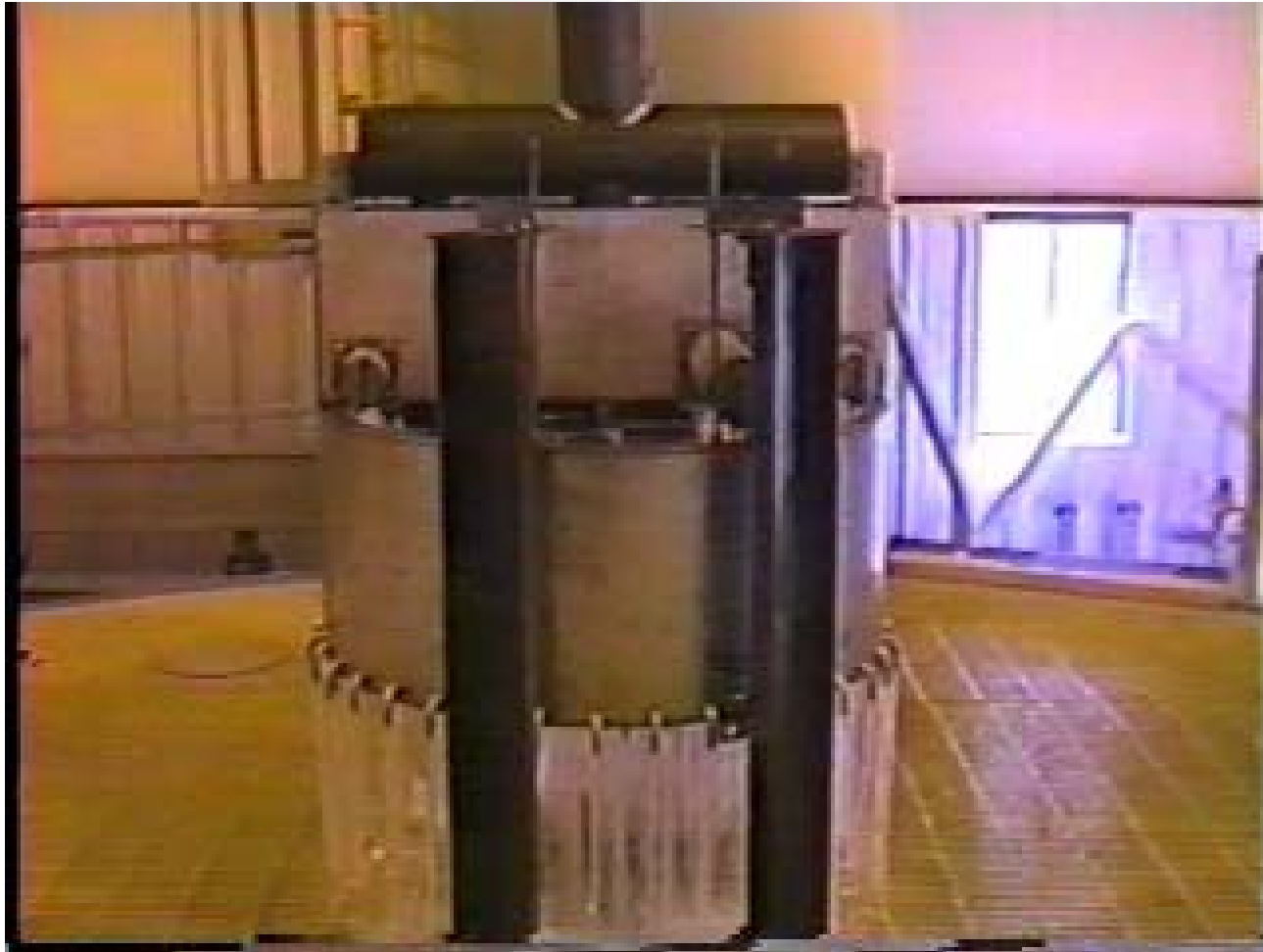
# No. 2.5 Nutter Rings Setup with TDP Distributor



# *FRI TDP Distributor*



# *Mobil Distributor (1)*



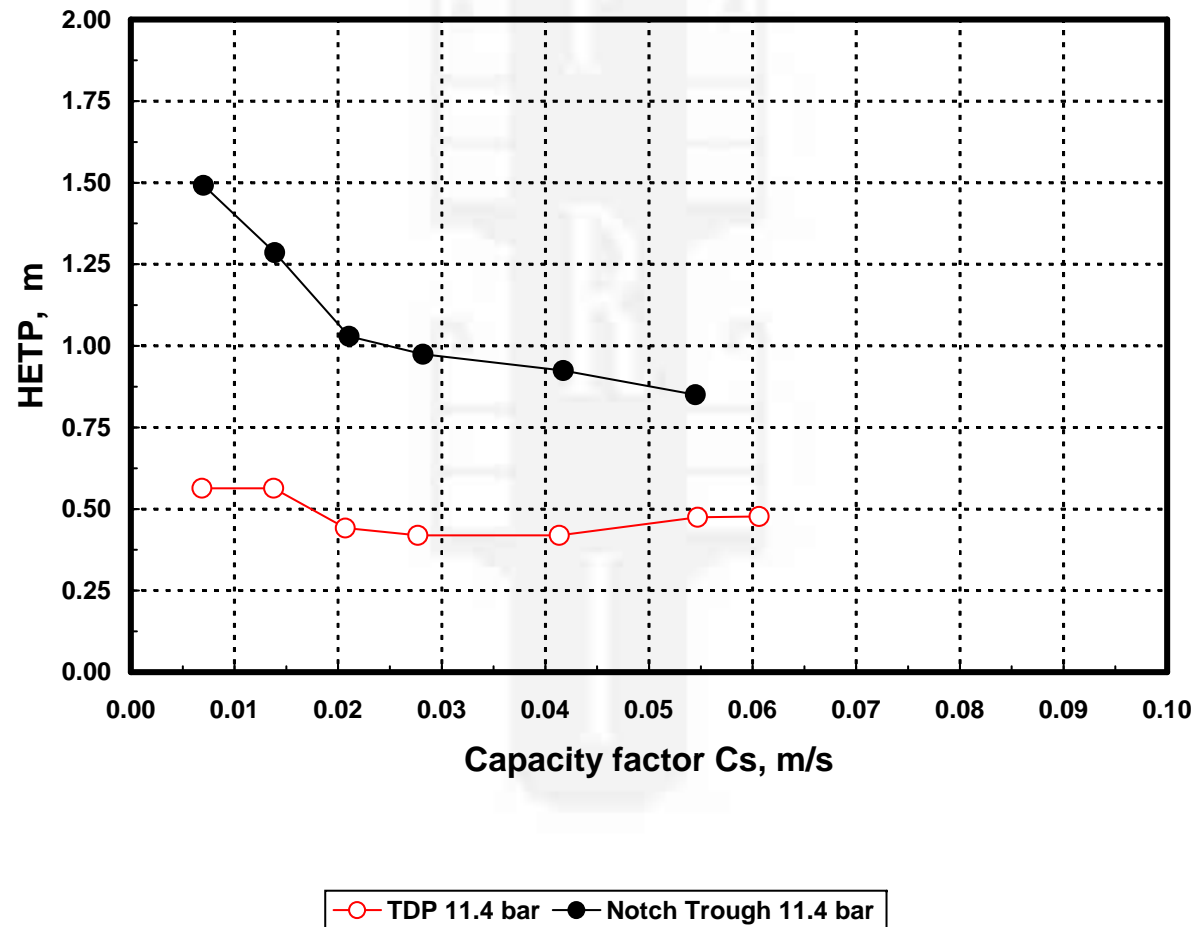
# *Mobil Distributor (2)*



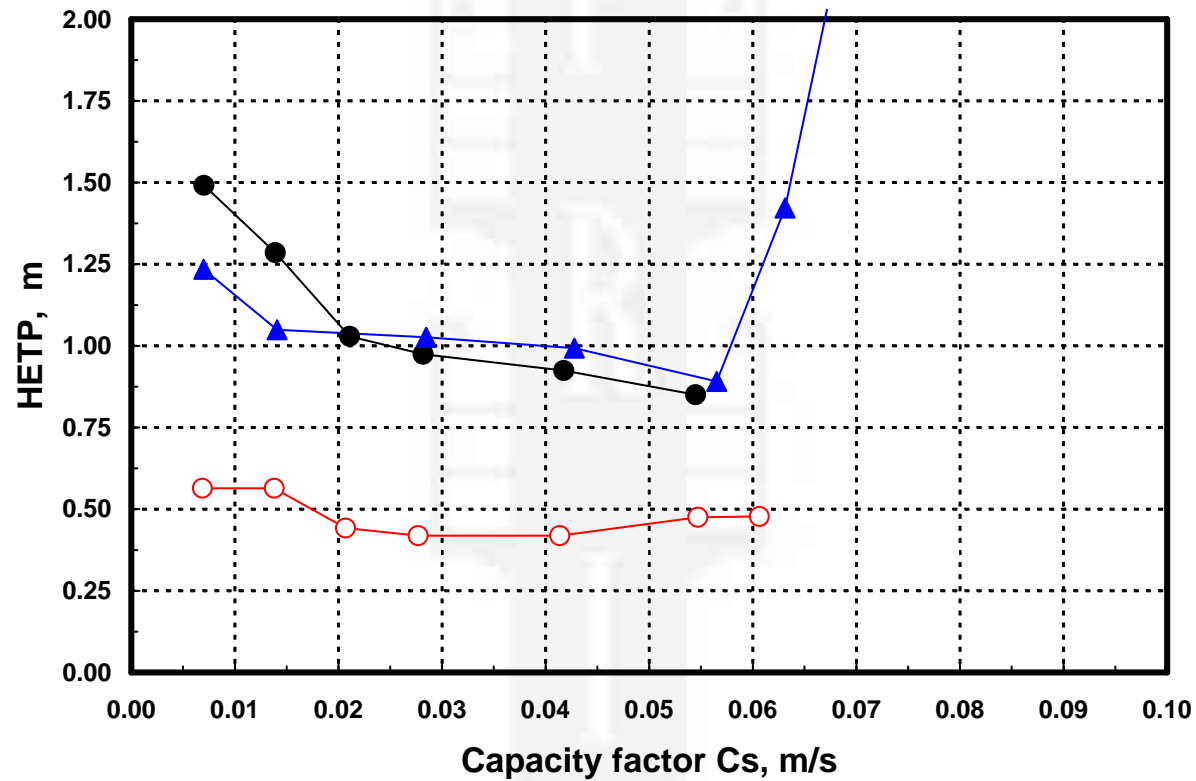
# *Results*



# 50 mm Pall rings Results

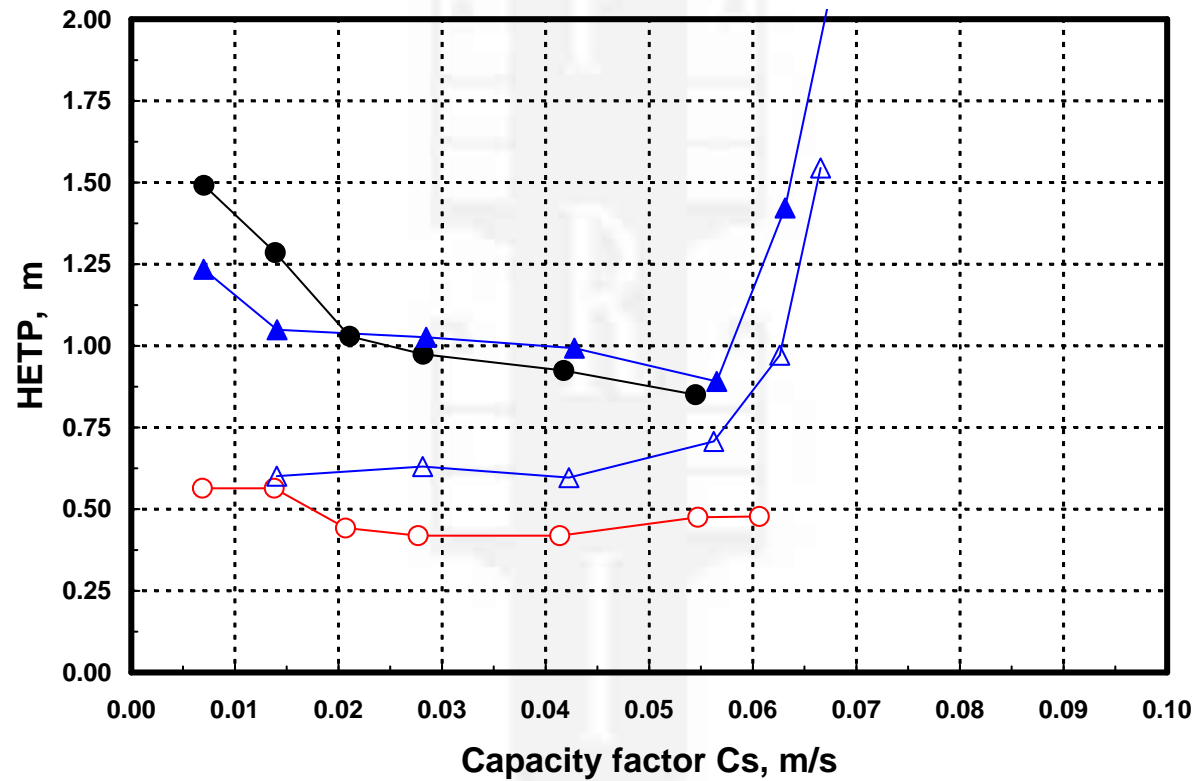


# 50 mm Pall rings Results



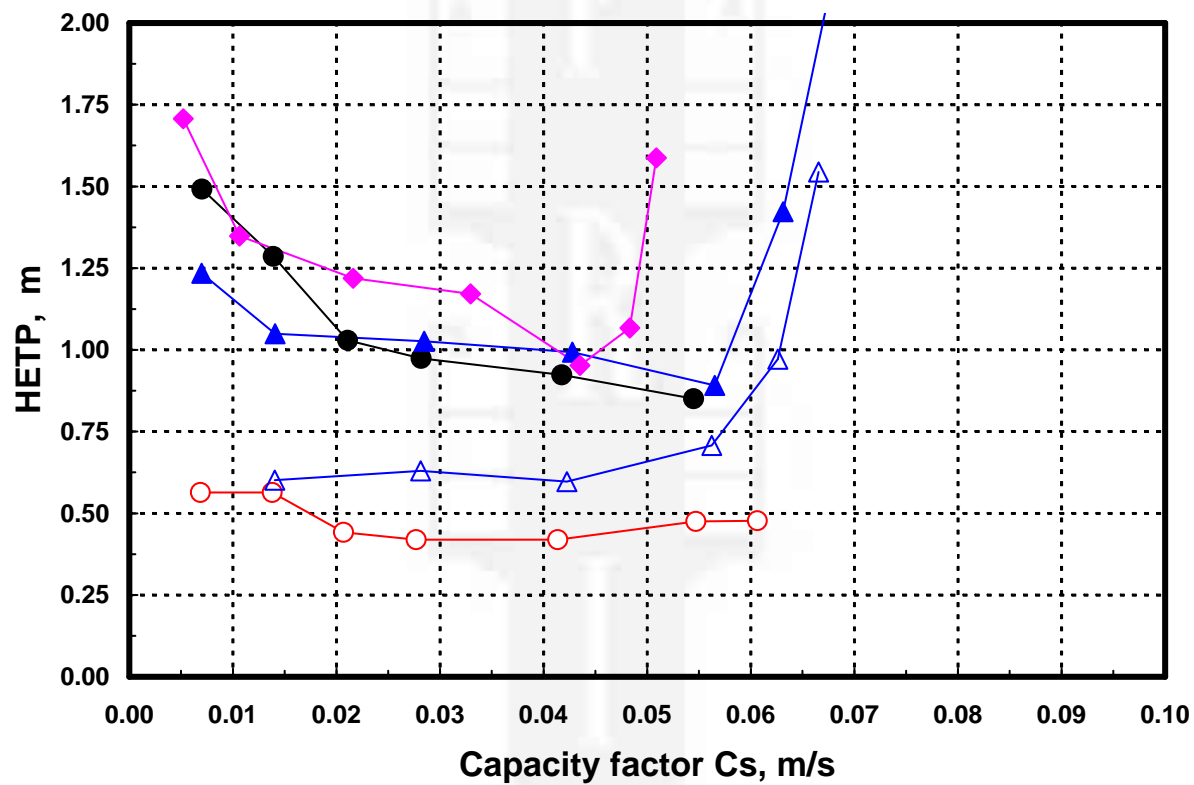
● Notch Trough 11.4 bar ▲ Notch Trough 20.4 bar ○ TDP 11.4 bar

# 50 mm Pall rings Results



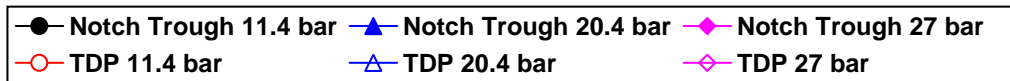
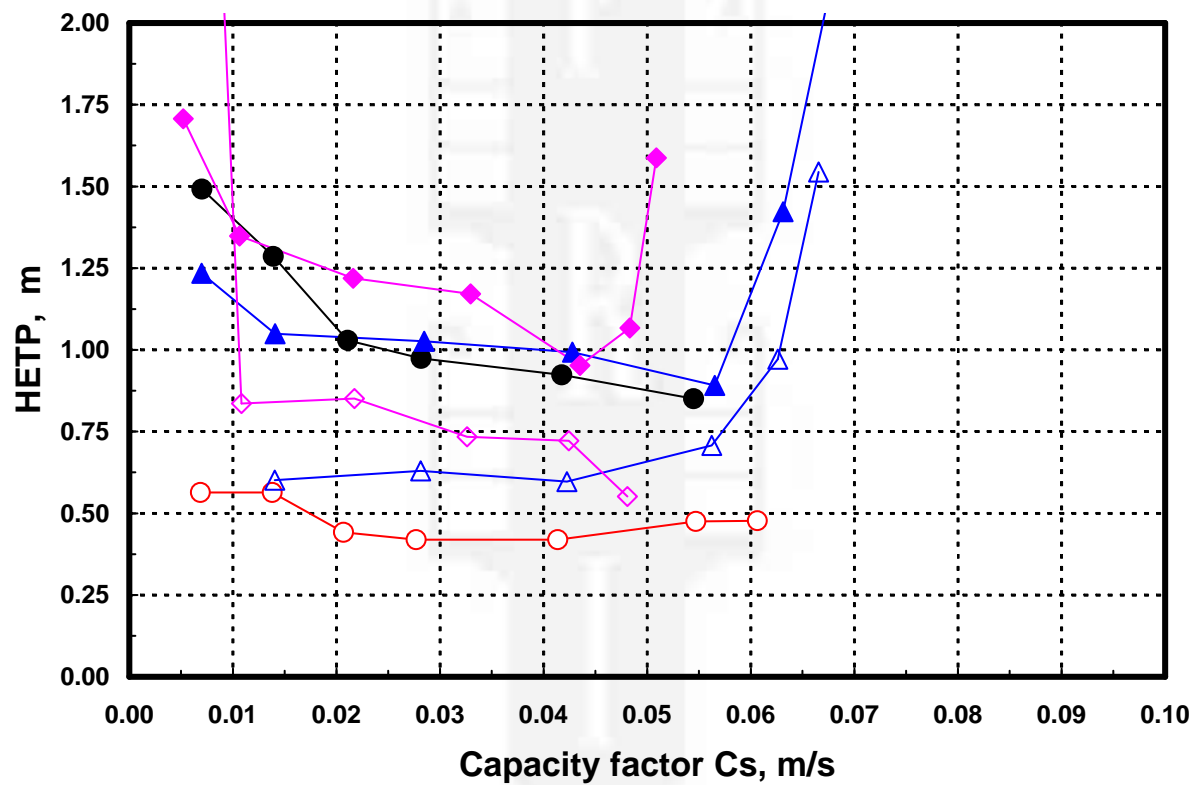
● Notch Trough 11.4 bar ▲ Notch Trough 20.4 bar ○ TDP 11.4 bar △ TDP 20.4 bar

# 50 mm Pall rings Results

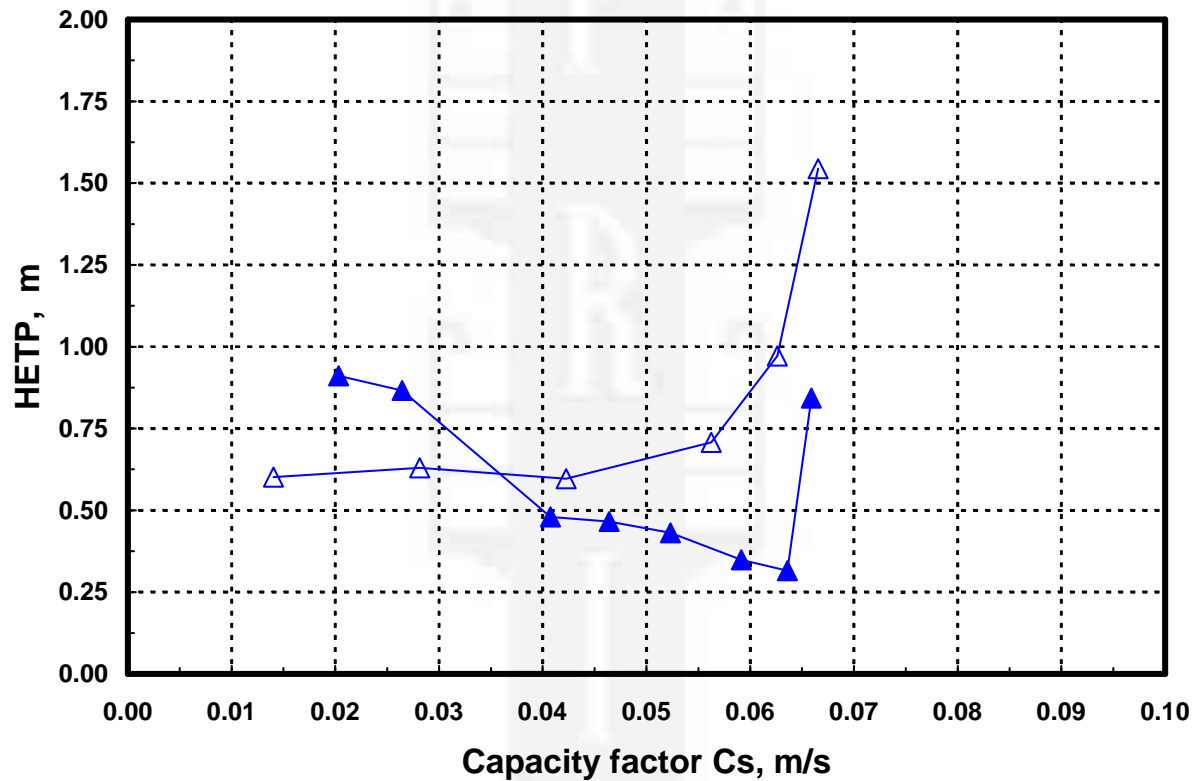


● Notch Trough 11.4 bar    ▲ Notch Trough 20.4 bar    ◆ Notch Trough 27 bar  
○ TDP 11.4 bar    △ TDP 20.4 bar

# 50 mm Pall rings Results

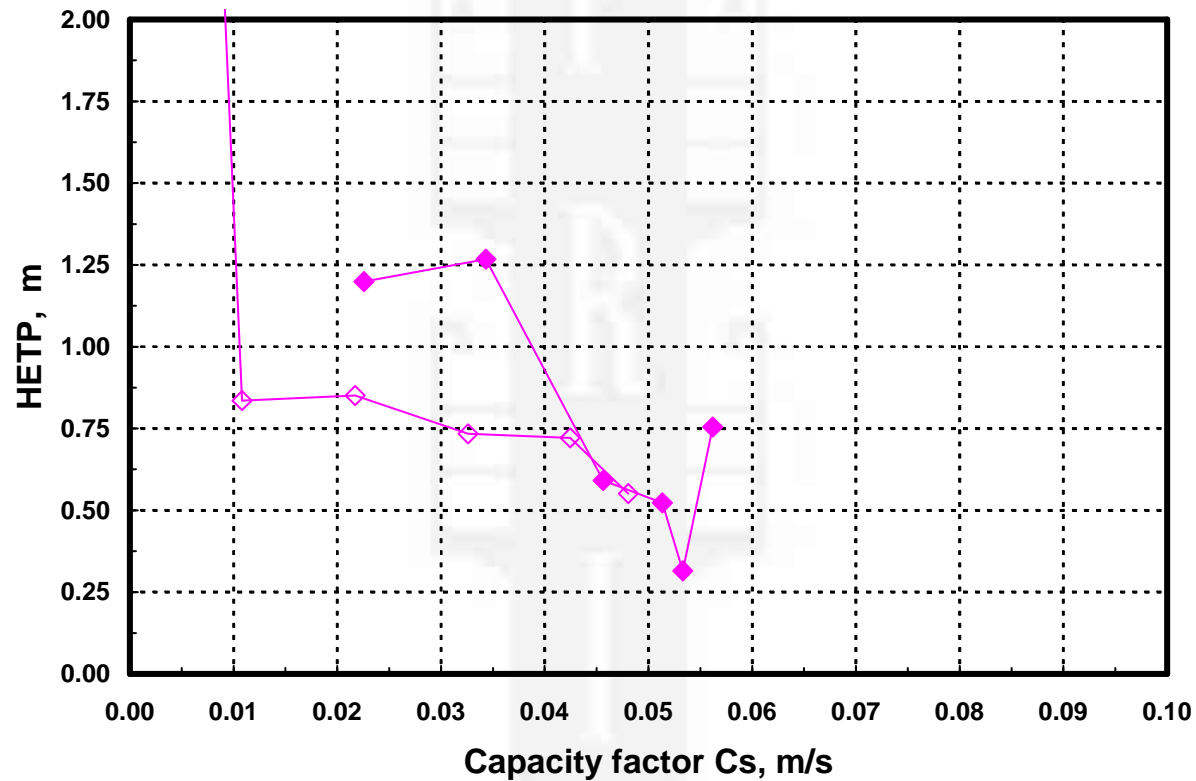


# Results of Pall rings and Nutter rings



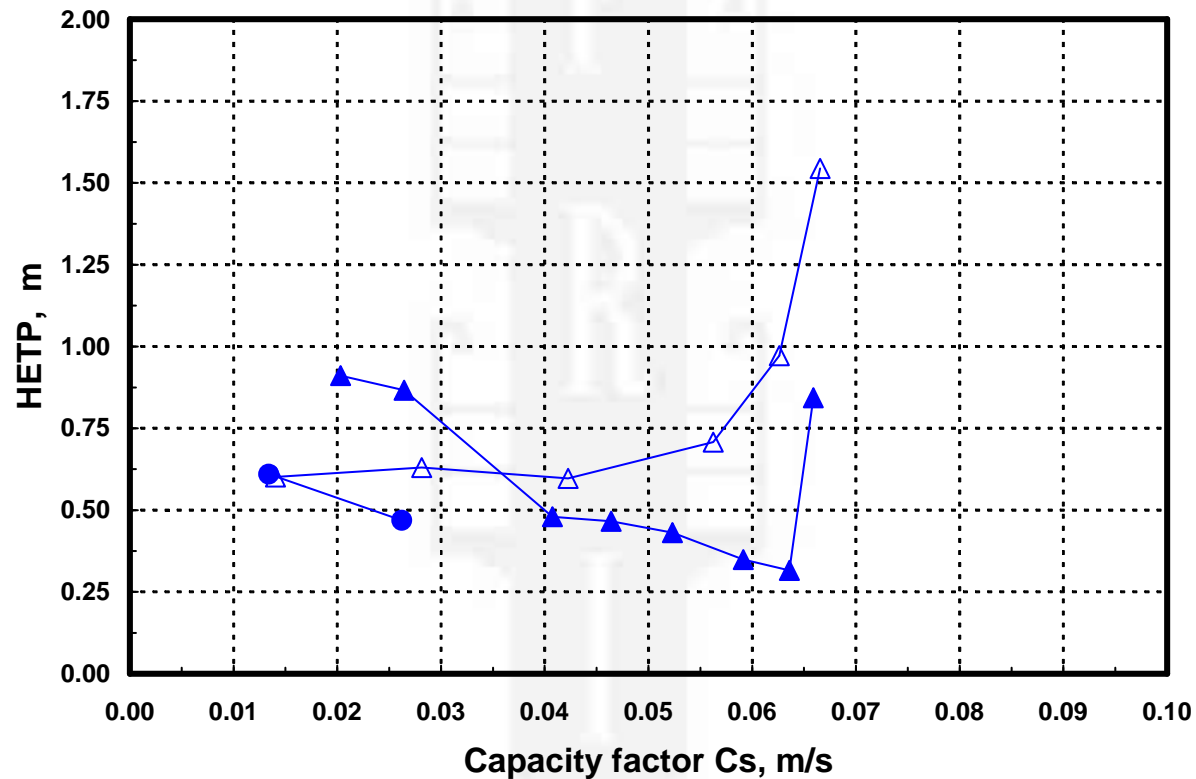
△ 50 mm Pall Ring TDP 20.4 bar    ▲ Nutter Ring 2.5 -Mobile Pan Distributor 20.4 bar

# Results of Pall rings and Nutter rings

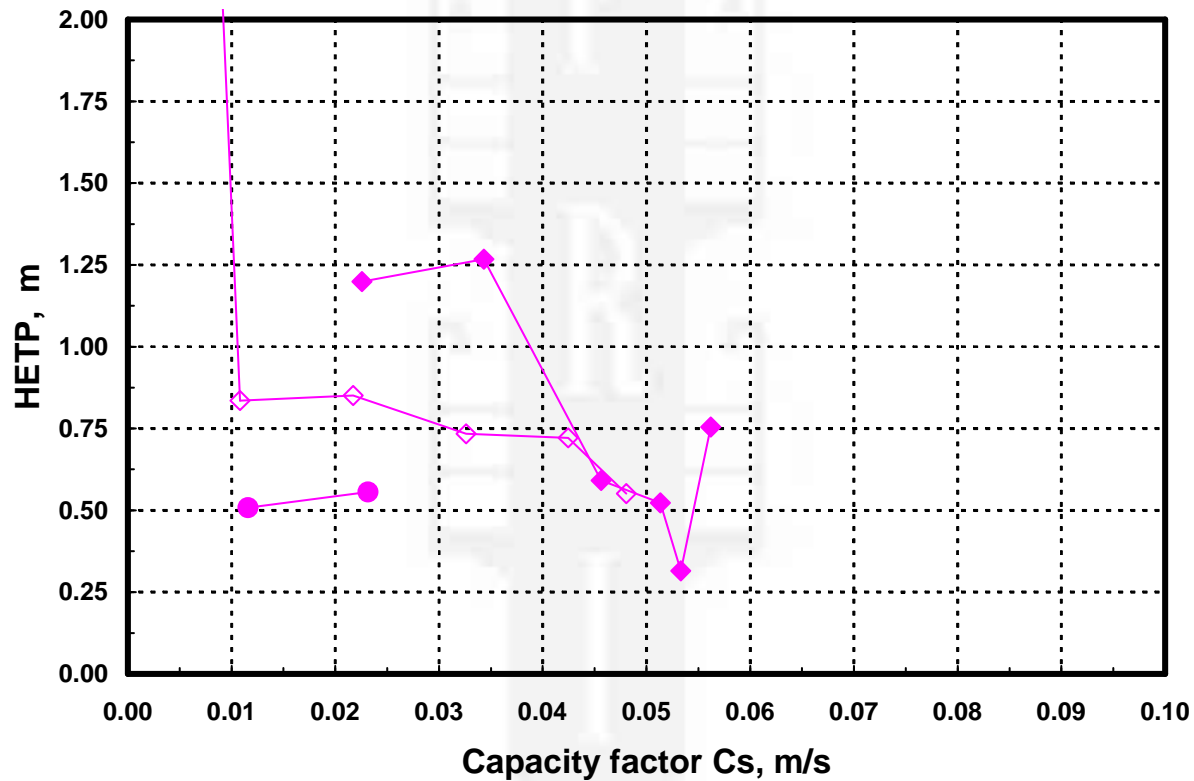


◇ 50 mm Pall Ring TDP 27 bar ◆ Nutter Ring 2.5 Mobile Pan Distributor 27 bar

# Results of Pall rings and Nutter rings

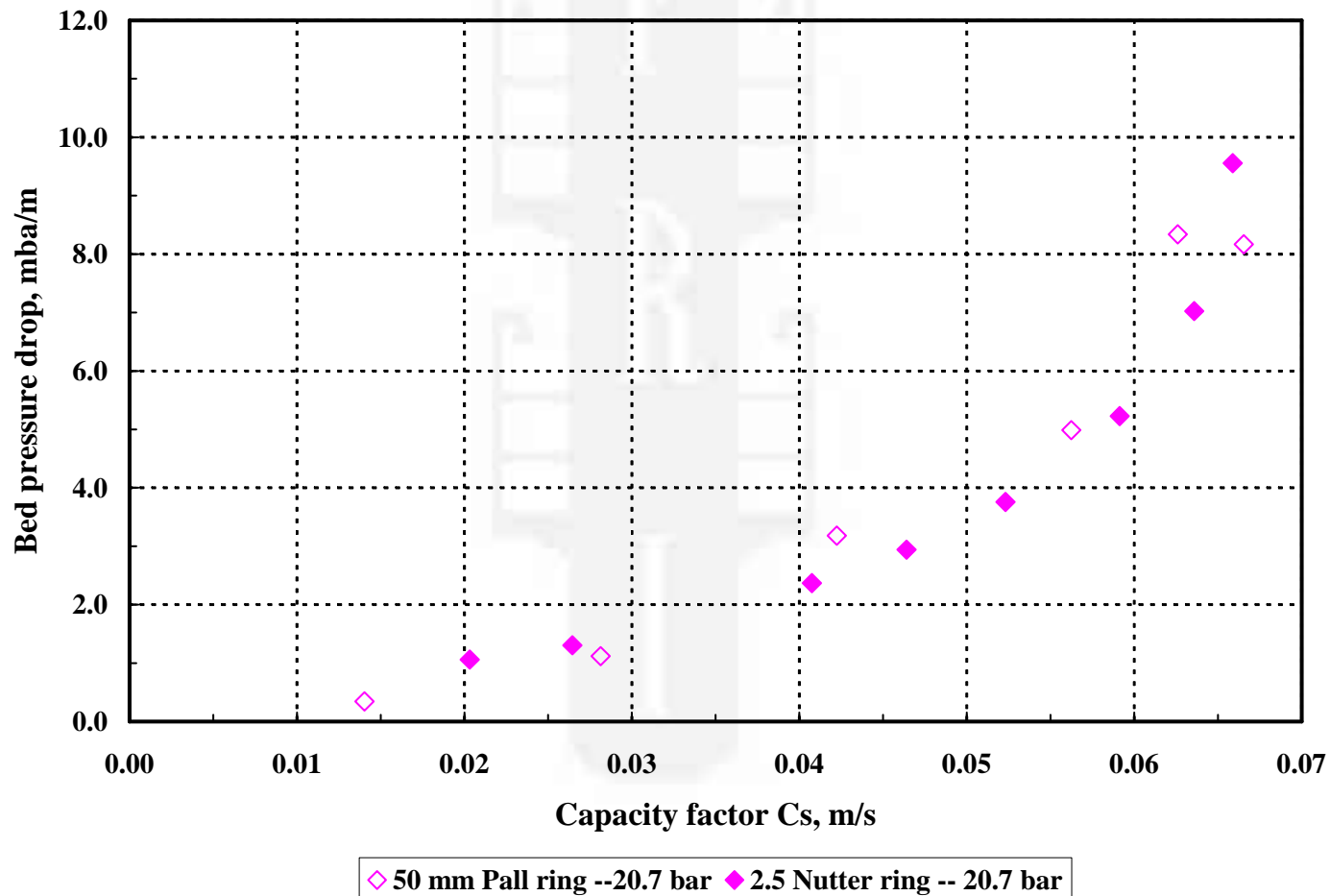


# Results of Pall rings and Nutter rings

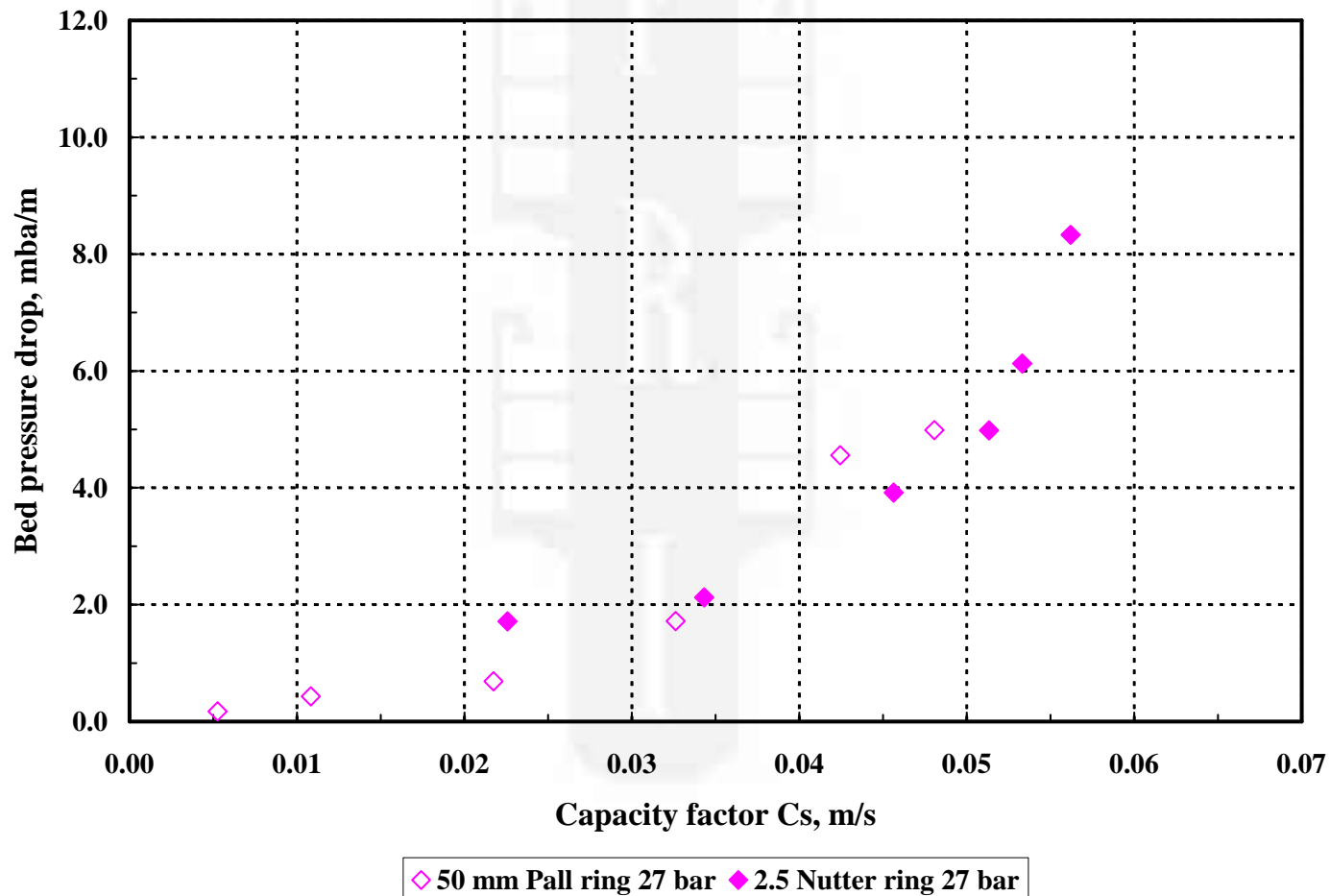


◆ 50 mm Pall Ring TDP 27 bar ◆ Nutter Ring 2.5 Mobile Pan Distributor 27 bar ● Nutter Ring 2.5 TDP 27 bar

# Results of Pall rings and Nutter rings



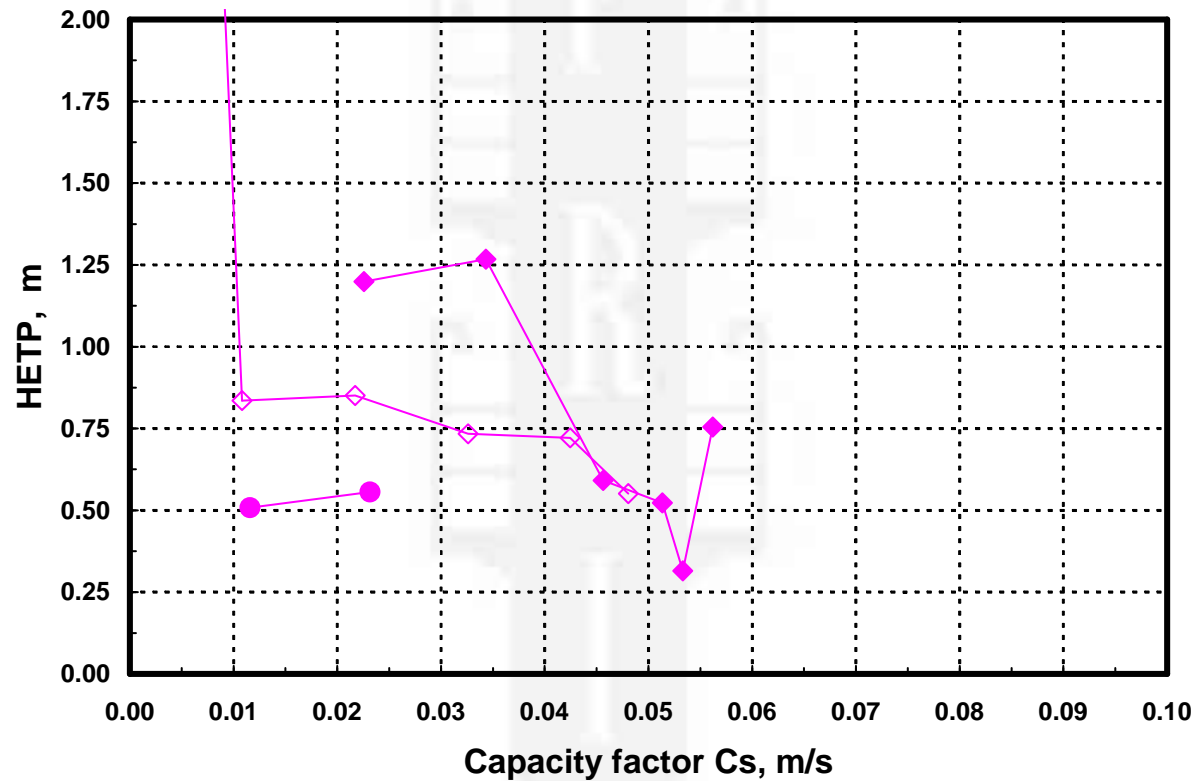
# Results of Pall rings and Nutter rings



# *WHY?? Possible Causes*

- **Poor distributor performances**
  - **High Cv values**
  - **Others**
- **Vapor back-mixing**
- **Samplers**
- **Sub-cooled Reflux Effect**

# Results of Pall rings and Nutter rings



◇ 50 mm Pall Ring TDP 27 bar    ◆ Nutter Ring 2.5 Mobile Pan Distributor 27 bar    ● Nutter Ring 2.5 TDP 27 bar

# *Discussions & Conclusions*

- **The experimental results show unusual HETP trend and higher HETP than expected**
- **The measured data also have a high degree of scatter for high pressure systems**
- **The distributors affect the packing performance significantly**
- **The sub-cooled reflux may affect the packing performance due to vapor condensation around the distributor**
- **A larger than usual safety factor is suggested for the random packing application at high pressure systems**
- **More studies are needed to fully understand the performance of random packings with high pressure systems**

# *Acknowledgements*

- **Authors would like to extend their great appreciations to:**
  - **FRI memberships for their continuous support to FRI research program**
  - **Henry and Mike for their great work on this symposium**