



MEGA columns: Challenges and Solutions (Part 2)

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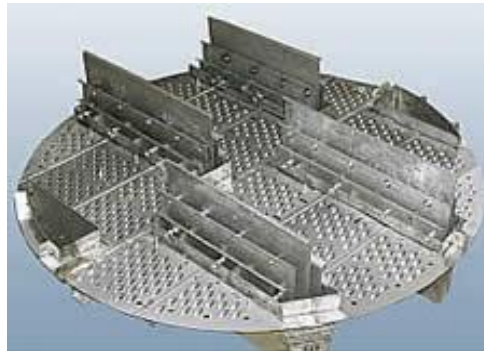
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Shell Technology

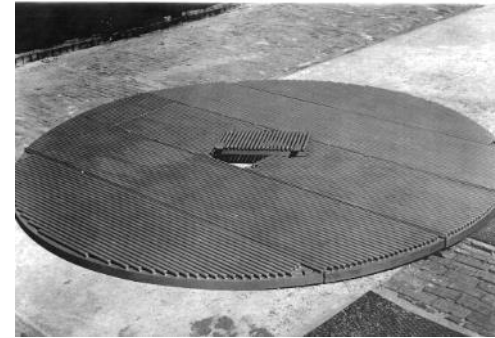
Calming Section Plus Trays



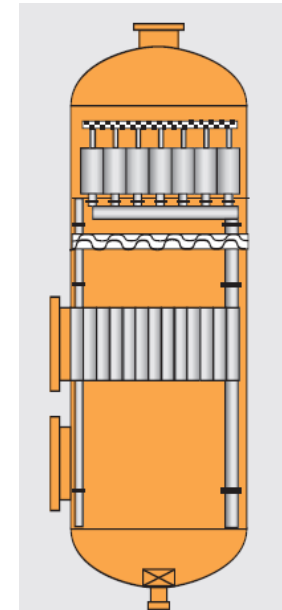
HiFi Plus Trays



Shell grid trays



Separators



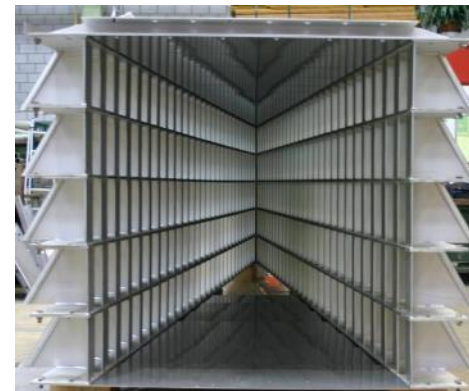
ConSep Trays



Shell HiFi extraction trays



Schoepentoeter Plus



Shell Distillation R&D Heritage: over 60 years so far...

1963 - 1989



**2.5 m diameter
column at KSLA**

1989 - 2016



**0.45 / 0.63 m diameter
column at STCA**

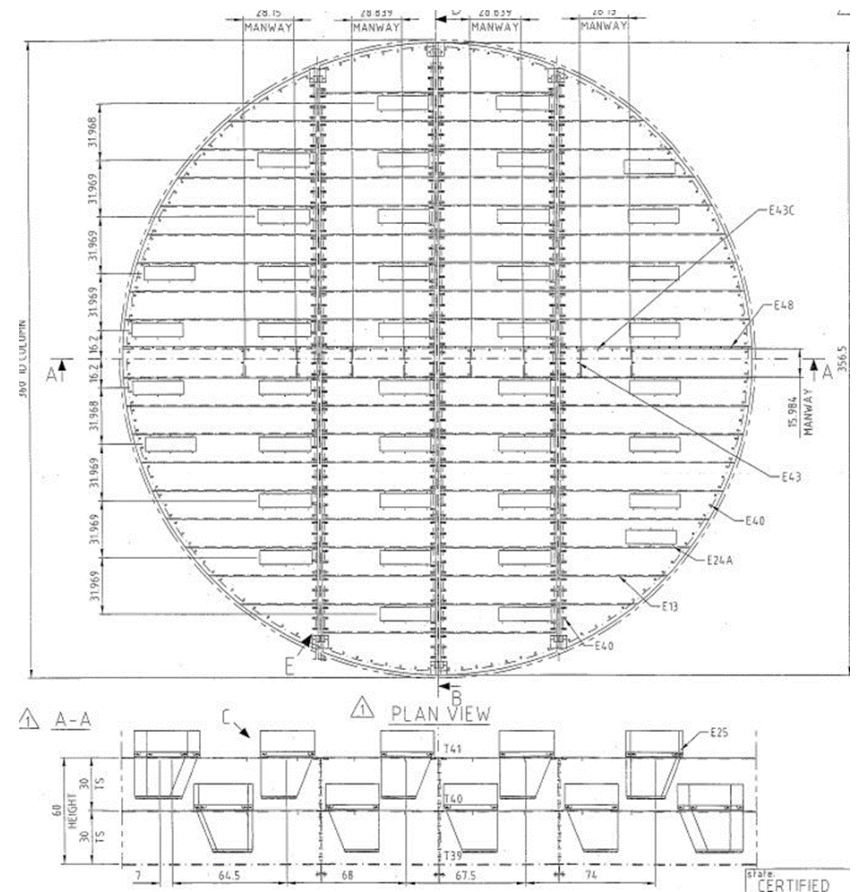
2017 - Present



**0.63 m diameter
column at STCB
(India)**

Calming Section Trays

- Maximizes bubbling area using truncated 'box shaped' downcomers
- Froth bed and vapor region are continuous throughout the cross section.
- Easy to scale to large diameter (array of more boxes of same size)
- Identical weir length for odd and even trays
- DC are fabricated in the shop (Segmental use column wall as part of DC)
- Available in boltless construction. Minimum installation time.
- Used in low pressure applications (where downcomer areas are $< 10\%$)

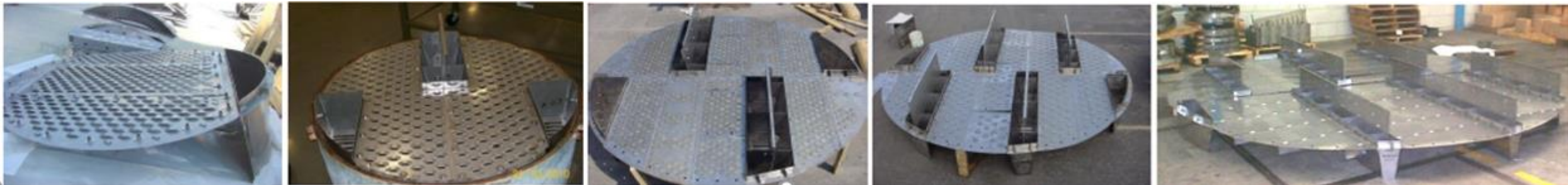


- Note use of 3 beams due to large diameter

HiFi Trays

- Meant for high liquid loads
- 'Fi' = ϕ = Flow Parameter
- Layout maximizes weir length
- **Reliable scale-up, self balancing hydraulics, no multi-pass complications**
- Available in 1, 3, 4, 5, 6, 7, 8+ downcomer layouts
- Provides a defined flow path that enhances efficiency
- Used in Gas Plants, DIBs, Amine Columns, C3 and C2 Splitters, etc.

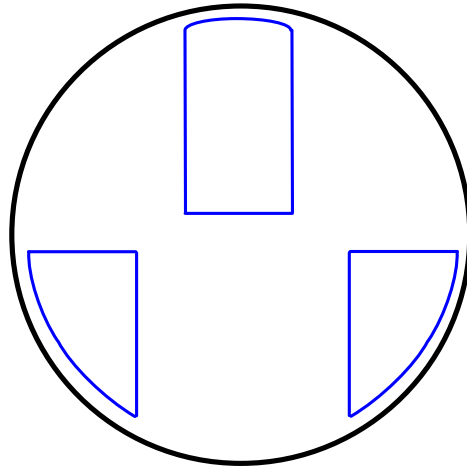
$$\phi = \frac{L}{V} \sqrt{\frac{\rho_g}{\rho_l}}$$



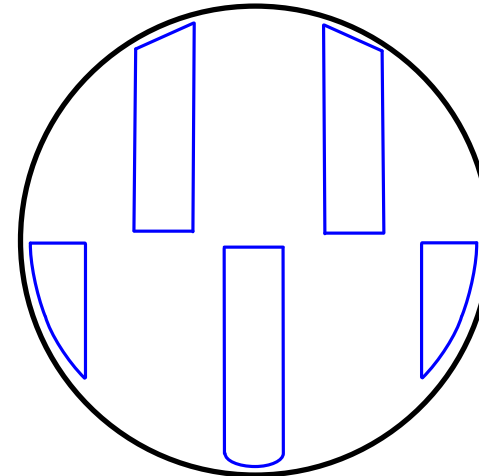
Example HiFi Downcomer Layouts (note column diameter would be increasing)

- Note a center beam is used for mechanical support, in the RED location shown in below left
- Panels and Downcomers are supported at the tray ring and by the central beam

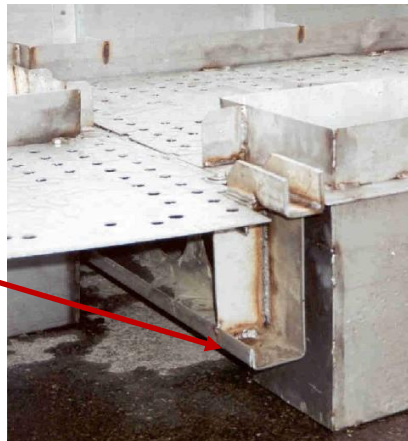
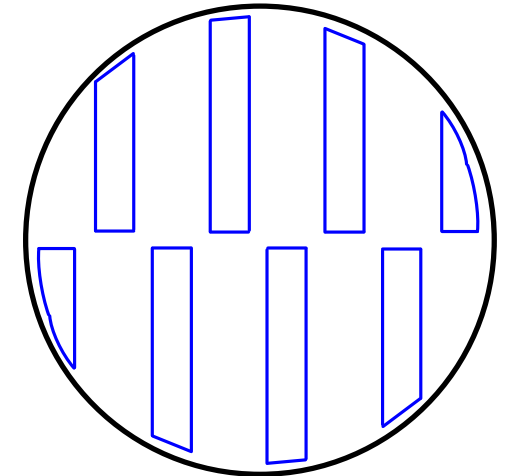
3 Bucket



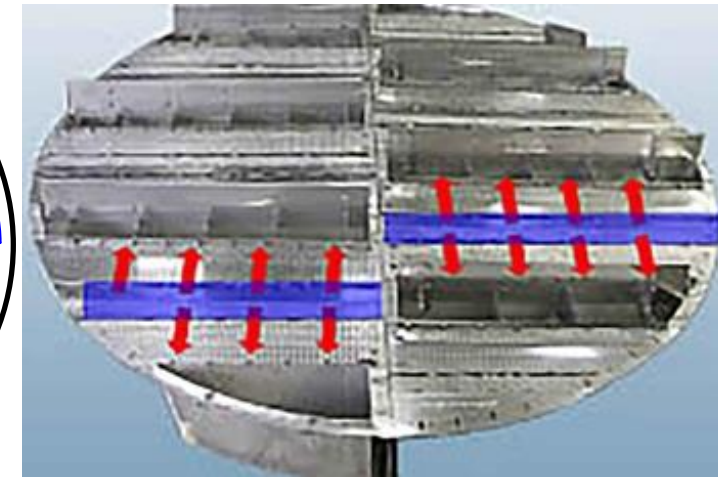
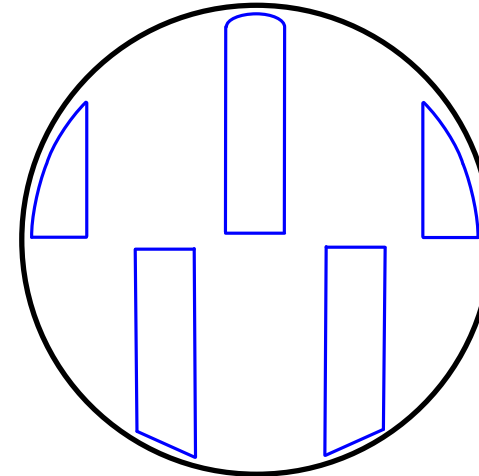
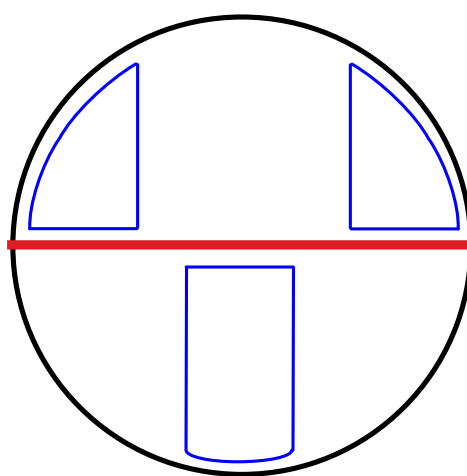
5 Bucket



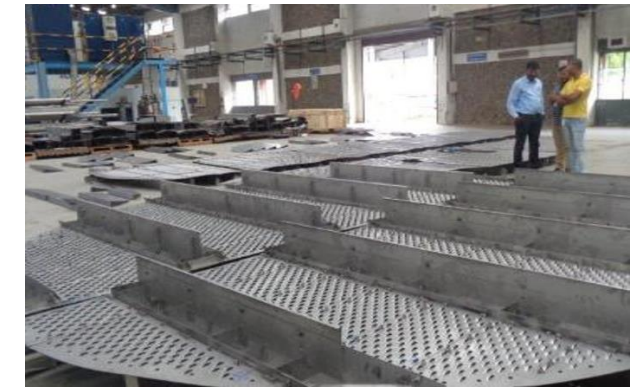
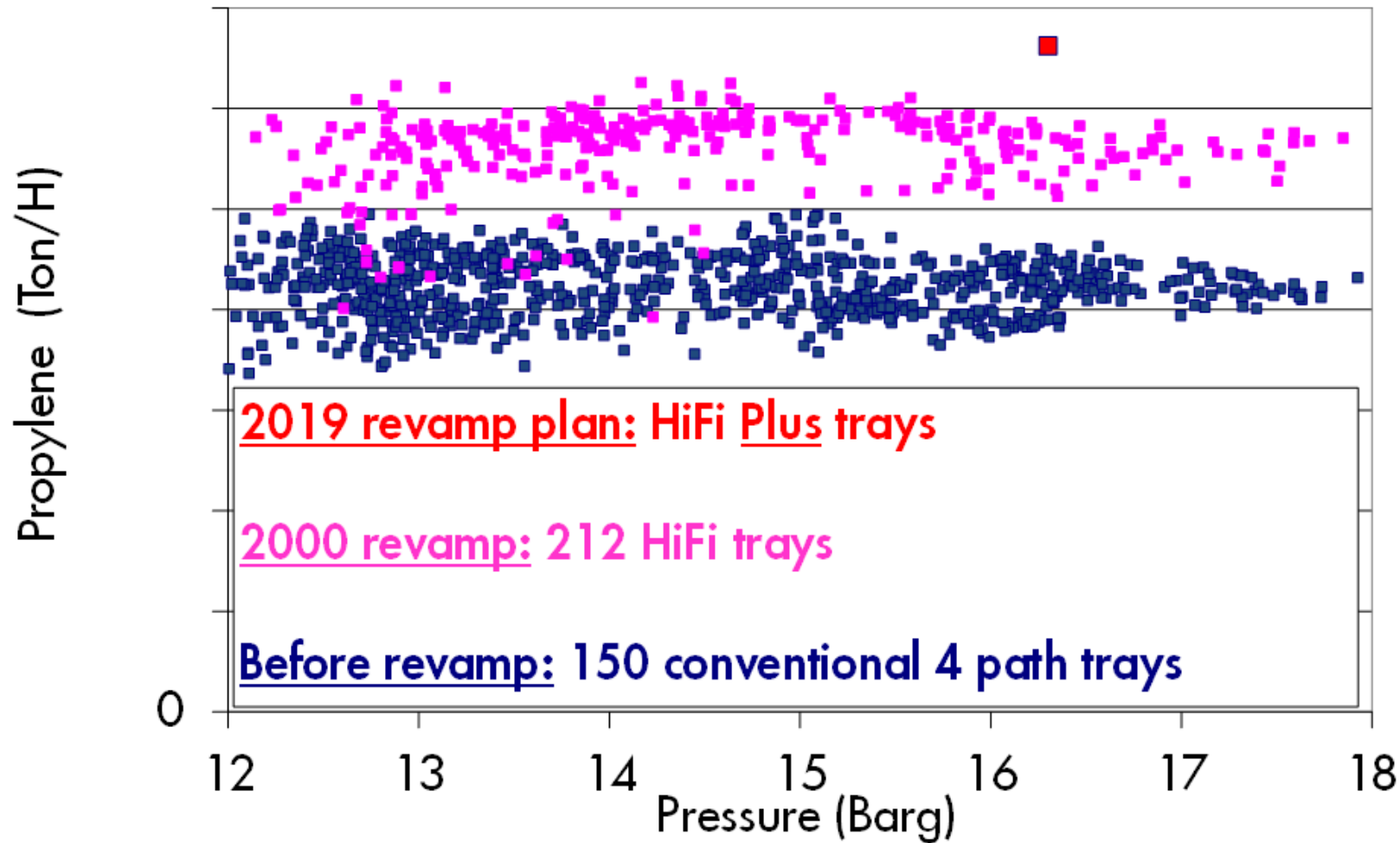
8 Bucket



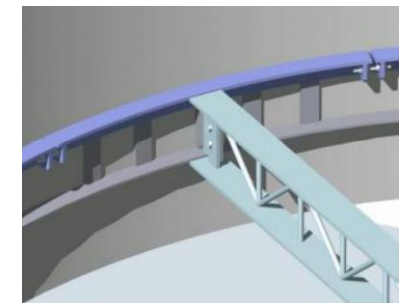
Center Beam



Large PP-splitter revamp example (1)



■ HiFi plus tray installed in 2019



■ Expansion rings required in 2000 to reduce tray spacing to 305 mm

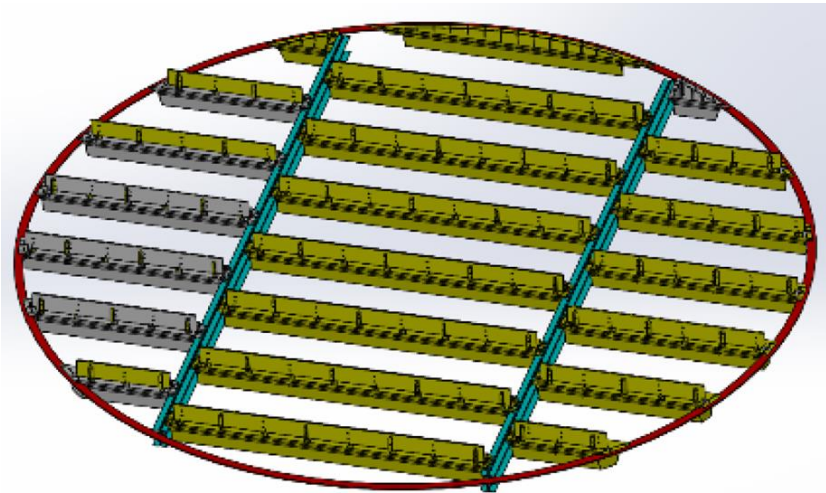
Large PP-splitter revamp example (2)

- Project preparations started 2 years before the revamp.
- Scaffolding is a major part of the work.
- The PP-splitter with 212 trays was fully retrayed within 4 weeks (including removal of 212 trays).
- All (over 12000) parts had to enter the column using elevators and cranes and pass through manways

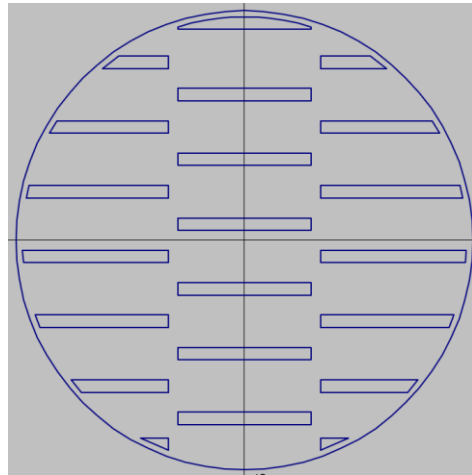


Mega Size PP-splitter

- The previous slides were showing a large PP-splitter with HiFi trays. For even larger 'MEGA Size' HiFi trays we have implemented alternative two beam designs:



■ D=10.4 m (PP-splitter)



■ D=9.6 m (CDU)

- Note that each odd and even trays are identical (but rotated)

Summary and conclusions

- The number of MEGA columns is steadily increasing.
- These columns have specific challenges due to:
 - Maintaining tight specifications on levelness
 - Introducing two phase feeds in a sufficiently uniform manner.
 - Scale-up of trays to ensure uniform flows across the full column cross sectional area.
 - Larger mechanical tolerances related to column out of roundsness and thermal expansion
 - Mechanical design of support structures.
 - Installation time (especially for revamps)
- These challenges have been discussed in this joint presentation and with a steadily growing reference list of successful MEGA column applications it is demonstrated that the aforementioned challenges can be successfully addressed.

Questions and Answers

Q&A

