

EFCE Working Party, 5.6.2003, Helsinki

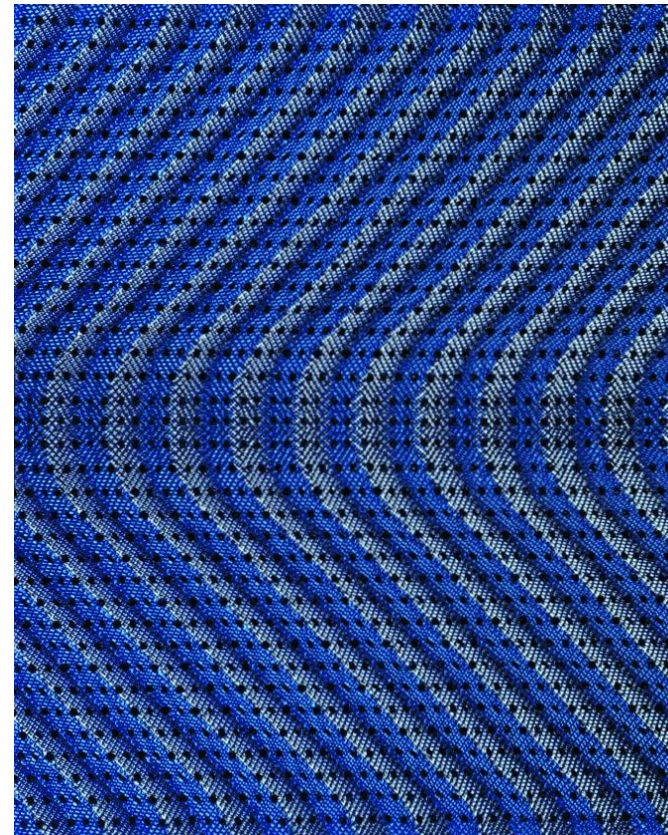
Improving Styrene Separation using Mellapak! Plus

Lothar Spiegel
Sulzer Chemtech Ltd, Winterthur, Switzerland



MellapakPlus

Progressive change of the **corrugation angle** at both ends of the element



Mellapak

MellapakPlus

MellapakPlus

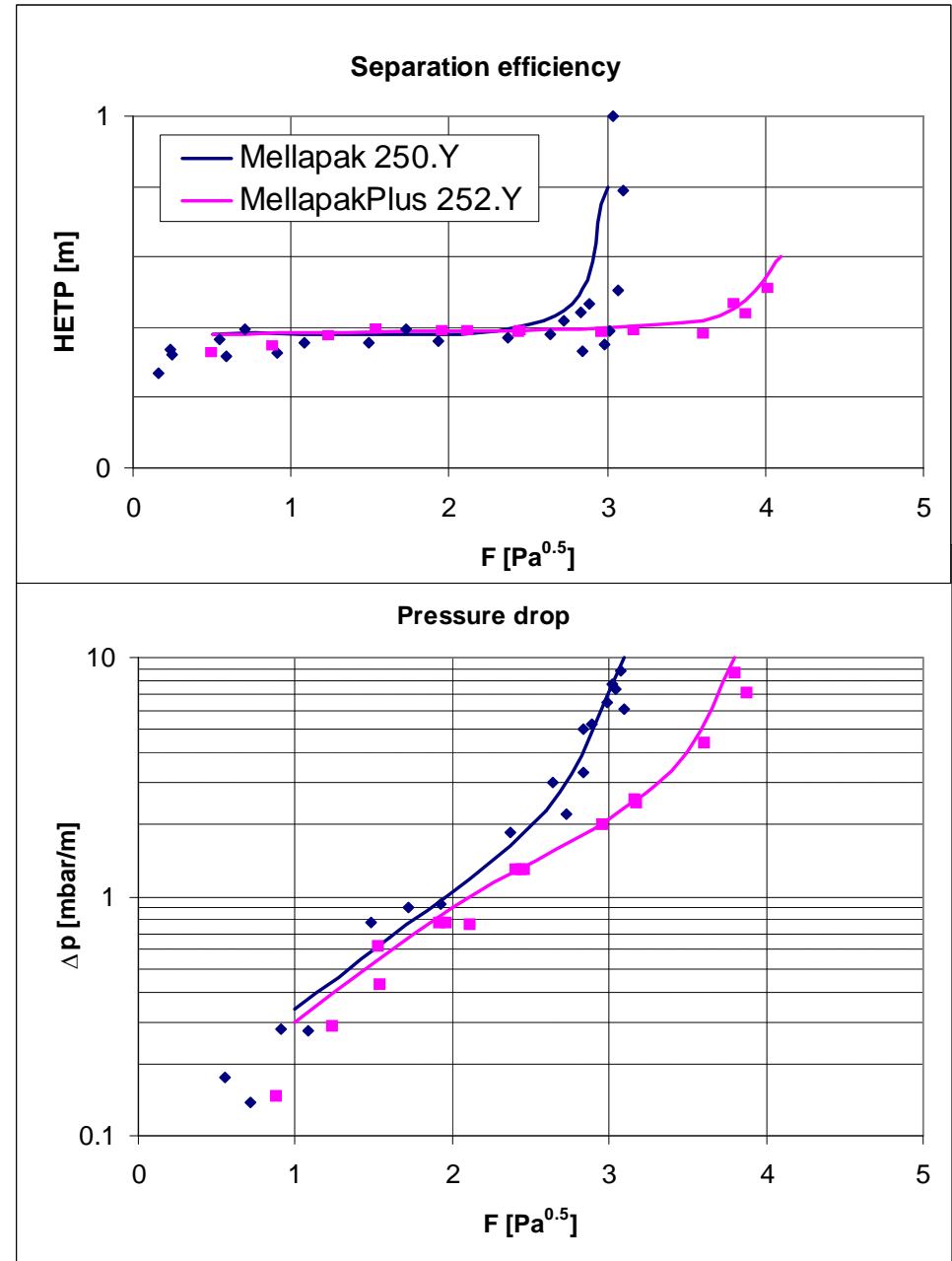
Performance of MellapakPlus

**MellapakPlus
252.Y** →

Column diameter:	1m
Test mixture:	CB / EB
Top pressure:	100 mbar
Conditions:	total reflux

Types considered:

- MellapakPlus 252.Y
- MellapakPlus 452.Y
- MellapakPlus 752.Y

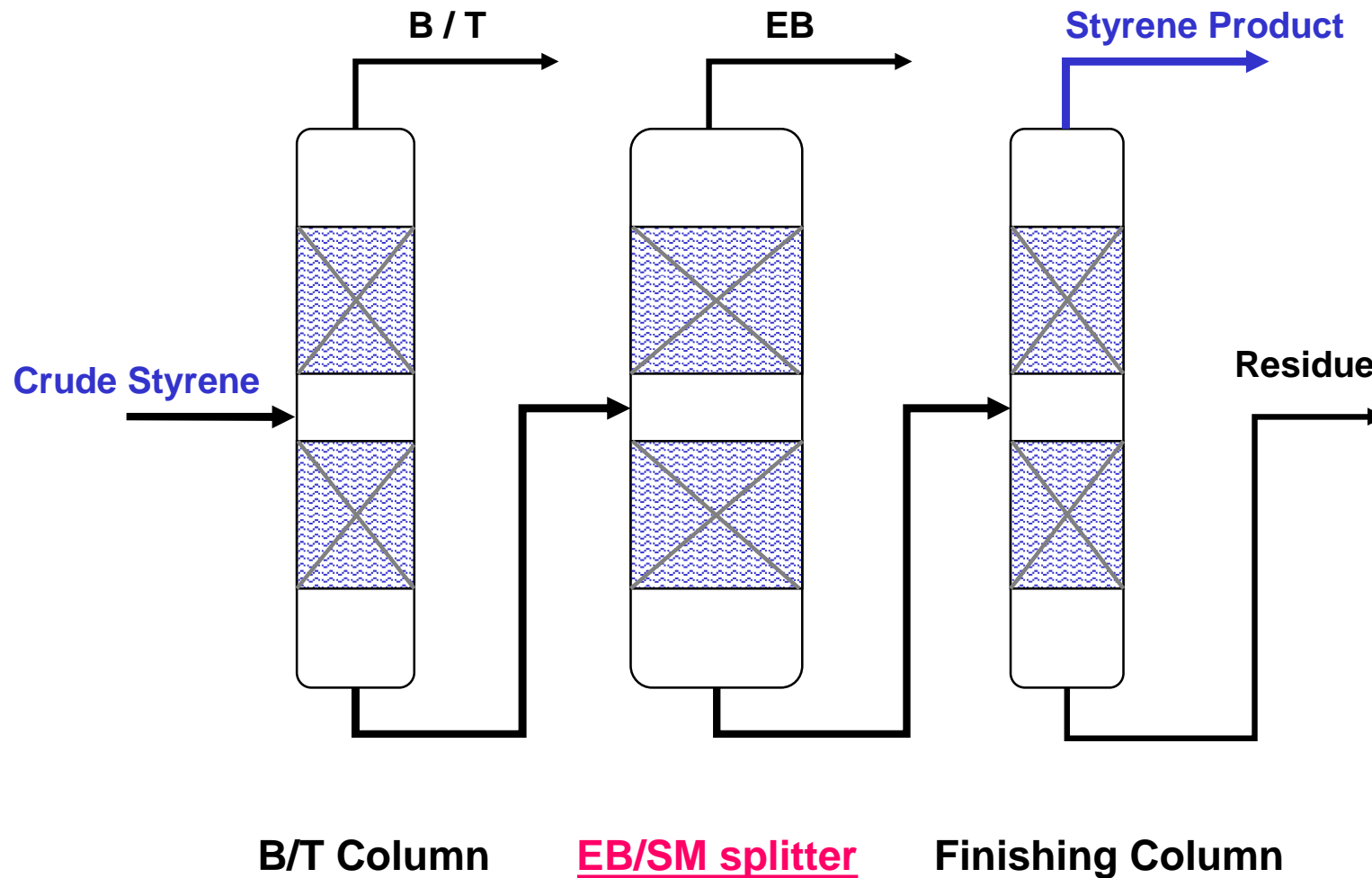


Current situation in styrene monomer distillation with structured packings

- ◆ **structured sheet metal packings** have been in commercial use since mid 70s
- ◆ ever growing area of application due to **high separation performance** and **low pressure drop**
- ◆ more than **15000 columns** with structured packings delivered by Sulzer Chemtech, of which **some 100 columns for styrene monomer distillation**
- ◆ **current design philosophy relies upon Mellapak 250.Y**; most formerly trayed columns have been converted to structured packings

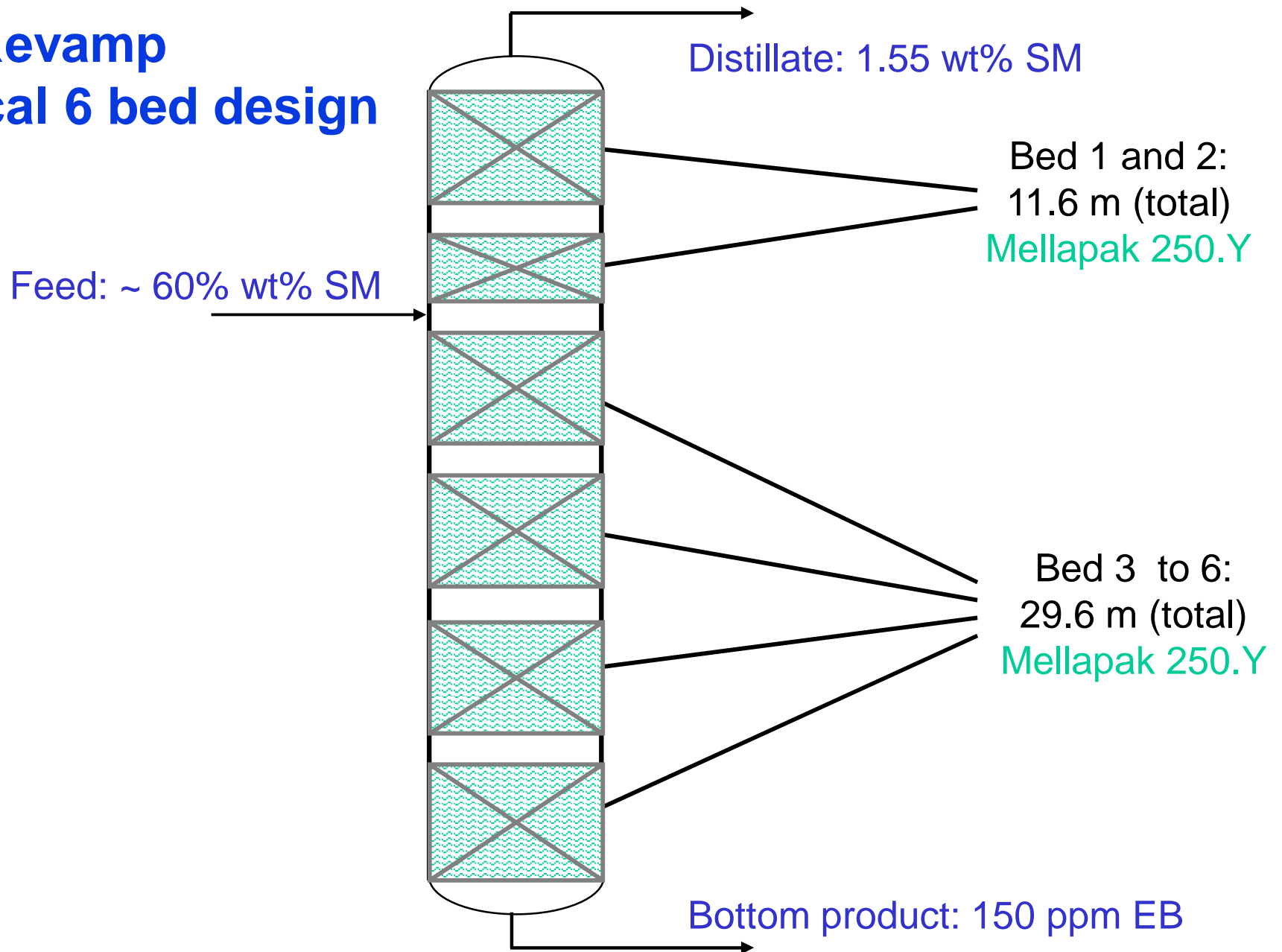
Revamp of Ethylbenzene / Styrene Splitter

Styrene Monomere Purification



Revamp of Ethylbenzene / Styrene Splitter

Revamp with typical 6 bed design



Revamp of Ethylbenzene / Styrene Splitter

Operating data		Actual M250.Y	Option A M252.Y	Option B1 M452.Y	Option B2 M452.Y
SM Capacity	[to/year]	198'000	277'500	265'000	295'000
Capacity increase	[%]		40	33	49
SM Top	[wt %]	1.55	1.55	1.0	1.55
EB Bottom	[ppm]	150	150	< 10	150
Pressure Top	[mbar]	106	106	106	106
Bottom	[mbar]	146	173	215	215
Temperature Top	[°C]	68	68	68	68
Bottom	[°C]	88	90	96	96
Internal reflux ratio	[-]	8.1	8.1	8.1	7.25
F-Factor range	[Pa ^{0.5}]	1.7 ÷ 2.2	2.5 ÷ 3.1	2.3 ÷ 2.8	2.3 ÷ 2.8
NTS Top		25	25	40	40
Bottom		68	68	100	100

Revamp of Ethylbenzene / Styrene Splitter

MellapakPlus - Job List

Period 1999 - 2003

9.5 / 7.9	EB/SM splitter	USA	2000
9.5 / 7.9	EB/SM splitter	USA	2000
4.3	B/T column	USA	2000
6.0	Finishing	USA	2000
4.7	EB/SM splitter	Korea	2000
3.1 / 2.6	Finishing	Korea	2000
9.4 / 7.7	EB/SM splitter	Germany	2001
4.0	EB/SM splitter	Taiwan	2001
9.1 / 8.4	EB/SM splitter	USA	2001
8.8 / 7.9	EB/SM splitter	USA	2001
6.6	EB/SM splitter	Japan	2001
2.6	EB/SM splitter	China	2001
0.5	B/T column	Czech Rep.	2001
4.5 / 2.1	EB/SM splitter	Singapore	2001
6.4	EB/SM splitter	Taiwan	2002
4.7	EB/SM splitter	Taiwan	2002
5.8	EB/SM splitter	Japan	2002
4.7	EB/SM splitter	Brasil	2003
4.7	EB/SM splitter	Korea	2003
3.8	EB/SM splitter	Korea	2003

Conclusions

- ◆ The presented case shows that **MellapakPlus offers vast improvements** in applications of structured packings
- ◆ The improvement can be a significant increase in **capacity**, in better **purity**, higher **yield**, **energy** savings, or any combination.
- ◆ Hydraulic Calculation Program SULPAK available at www.sulzerchemtech.com
- ◆ Columns revamped so far **fully confirm** these expectations.