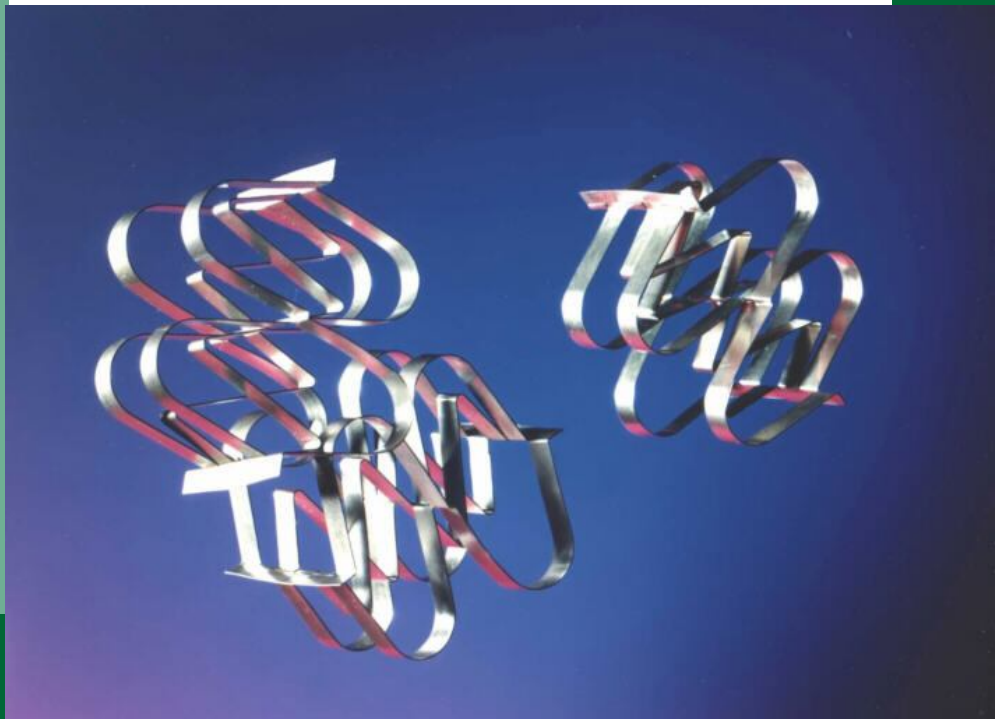




RASCHIG SUPER-RING

Proven in Practice and FRI tested

The world-renowned and recognized Fractionation Research, Inc. (FRI) in the USA is an association of the best-known companies in the field of petrochemistry, the chemical industry, plant and apparatus engineering and manufacturers of equipment parts. FRI currently operates the world's largest test facility for testing mass transfer trays and packings for rectification processes in the vacuum, normal-pressure and high-pressure range.





RASCHIG SUPER-RING

Proven in Practice and FRI tested

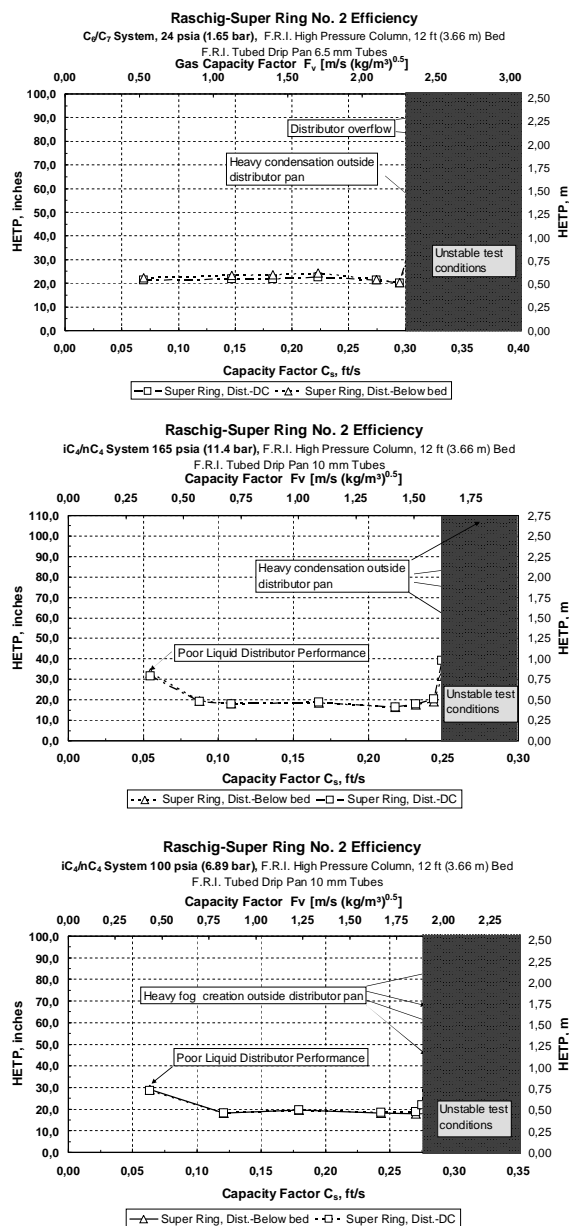
The revolutionary idea behind the design of the Raschig Super-Ring has now also led to exceptionally good mass transfer efficiencies, pressure drops and loading capacities in the FRI test facility. The structure of the Raschig Super-Ring is the first to pursue the objective of producing turbulent film-type flows and to prevent formation of drops. The large number of alternating wave swings also achieves large turbulences in the gas and liquid flows while at the same time it has an extremely open geometry.

Owing to the fluidically optimized shape of the Raschig Super-Ring, the randomly dumped packed bed automatically obtains a structure otherwise found only in the case of structured packings.

RASCHIG SUPER-RING

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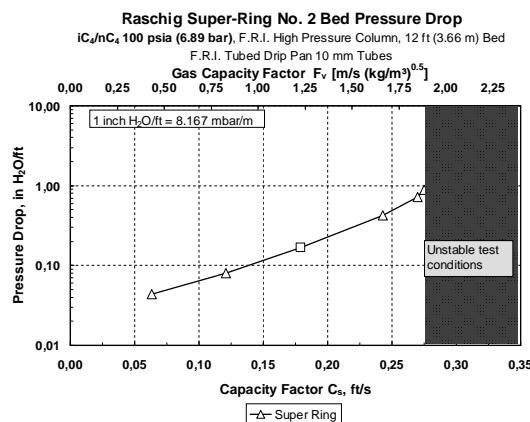
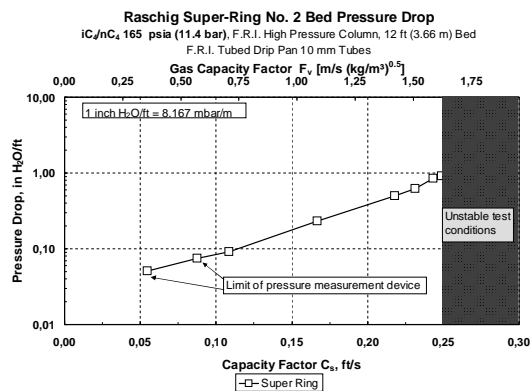
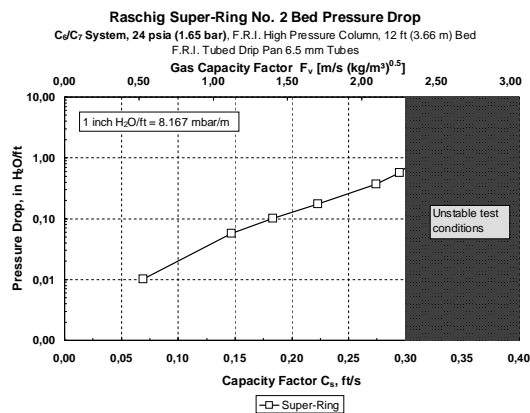
Fig. 1 provides information on the measured mass transfer efficiencies of the Raschig Super-Ring for the cyclohexane/n-heptane system at 1.65 bar and for isobutane/n-butane at 6.8 bar and 11.4 bar. The mass transfer efficiency of the Raschig Super-Ring is therefore not only better than the previous modern packings but also more favorable than that of structured packings with a comparable surface area. (Further information on request). Due to the malfunction of the distributor the mass transfer efficiency drops already previously which is mentioned in the figure as "unstable test conditions".



RASCHIG SUPER-RING

Proven in Practice and FRI tested

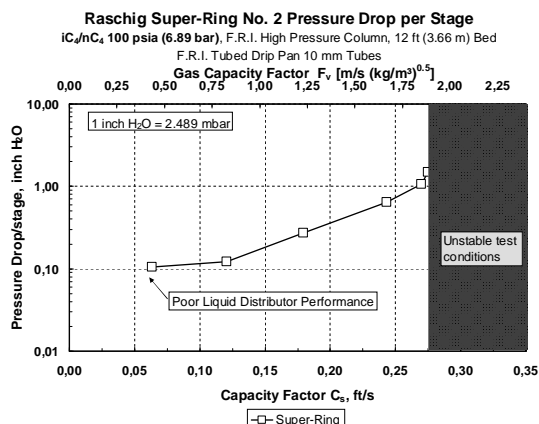
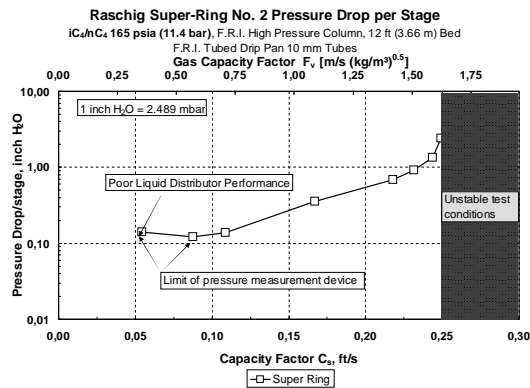
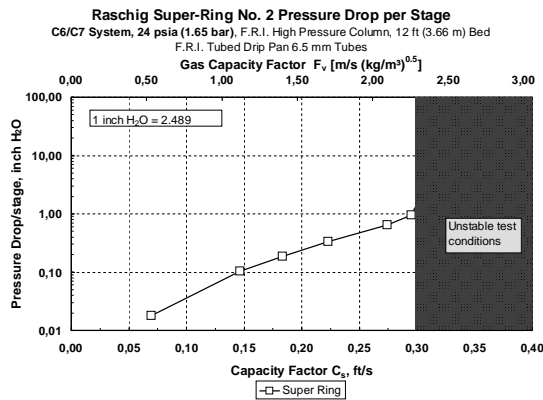
Fig. 2 shows that the pressure drop of the Raschig Super-Ring is not only far lower than that of the traditional Pall ring but also the pressure drops of previous modern packings. Due to the capacity limit of the FRI plant the flooding point with the Butane system was not reachable.



RASCHIG SUPER-RING

Proven in Practice and FRI tested

Fig. 3 shows the pressure drop per theoretical stage. Here the advantage of using our Raschig Super-Ring in mass transfer columns becomes especially clear. Despite an extremely low pressure drop, the large turbulence of the gas and liquid flow together with the especially good surface wetting causes an excellent mass transfer rate. The pressure drop per theoretical stage of the Raschig Super-Ring is therefore far below that of Pall rings and other modern packings.





RASCHIG SUPER-RING

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Tab. 1 gives a brief summary of the previous applications of our Raschig Super-Ring. The exceptionally good chemical engineering data were confirmed both in rectification and in absorption and desorption columns. Numerous mass transfer processes are operated with extreme dumping heights (up to 11 m) without liquid redistributors. These dumping heights can be achieved since the liquid and gas phases are distributed extremely evenly over the column cross section due to the optimal packing geometry, thus preventing mass transfer losses along the mass transfer column.

Tab.1: Extraction of applications for RASCHIG SUPER-RING

Natural gas plant	Methanol plant
Methionine plant	Butadiene plant
Caprolactam plant	N-Methylpyrrolidone plant
Refinery	Synthesis gas plant
Fatty acid plant	Effluent water treatment
Effluent gas plant	Ethylene plant
Ammonia plant	Hydrogen sulfide plant
Ethanol plant	Phenol plant
Formaldehyde plant	TDI plant

RASCHIG SUPER-RING

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Liquid distributor test-facility

In order to ensure the quality of our liquid distributors we used our liquid distributor test-facility. At the customer's request we can test distributors up to a diameter of 12 m.

Mechanical data of various Raschig Super-Ring's

Size	Material	Weight kg/m ³	Number pc./m ³	Surface m ² /m ³	Free Vol. %
Raschig Super-Ring No. 0.1	Metal	350	560.000	490	96
Raschig Super-Ring No. 0.3	Metal	230	180.000	315	96
Raschig Super-Ring No. 0.5	Metal	275	145.000	250	97
Raschig Super-Ring No. 0.6	Metal	235	74.000	215	98
Raschig Super-Ring No. 0.7	Metal	240	45.500	180	98
Raschig Super-Ring No. 1	Metal	220	32.000	150	98
Raschig Super-Ring No. 1.5	Metal	170	13.100	120	98
Raschig Super-Ring No. 2	Metal	155	9.500	100	98
Raschig Super-Ring No. 3	Metal	150	4.300	80	98
Raschig Super-Ring No. 4	Metal	134	3.900	70	98
Raschig Super-Ring No. 0.6	Plastic	62	60.000	205	93
Raschig Super-Ring No. 2	Plastic	55	9.000	100	96
Raschig Super-Ring No. 3	Plastic	52	4.000	75	97





RASCHIG SUPER-RING

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SUMMARY OF FRI TEST RESULTS

- ❑ SUBSTANTIAL HIGHER CAPACITY THAN WITH PALL-RINGS OR OTHER HIGH CAPACITY RANDOM PACKINGS
- ❑ SUBSTANTIAL LOWER PRESSURE DROP THAN WITH PALL-RINGS OR OTHER MODERN RANDOM PACKINGS
- ❑ ESSENTIAL BETTER MASS TRANSFER EFFICIENCY THAN WITH EQUIVALENT STRUCTURED PACKINGS



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