

PROCESS SIMULATION • TOWER PACKING • TOWER INTERNAL



MACH Engineering is a leading manufacturer of tower packings, column internals and custom fabrication.

The goal of our company is to provide the highest level of customer service with effective design solutions.

### Typical Applications Include:

FUME SCRUBBERS, AIR STRIPPERS, DISTILLATION, GLYCOL DEHYDRATION, COOLING TOWERS, BIOLOGICAL TRICKLING FILTERS

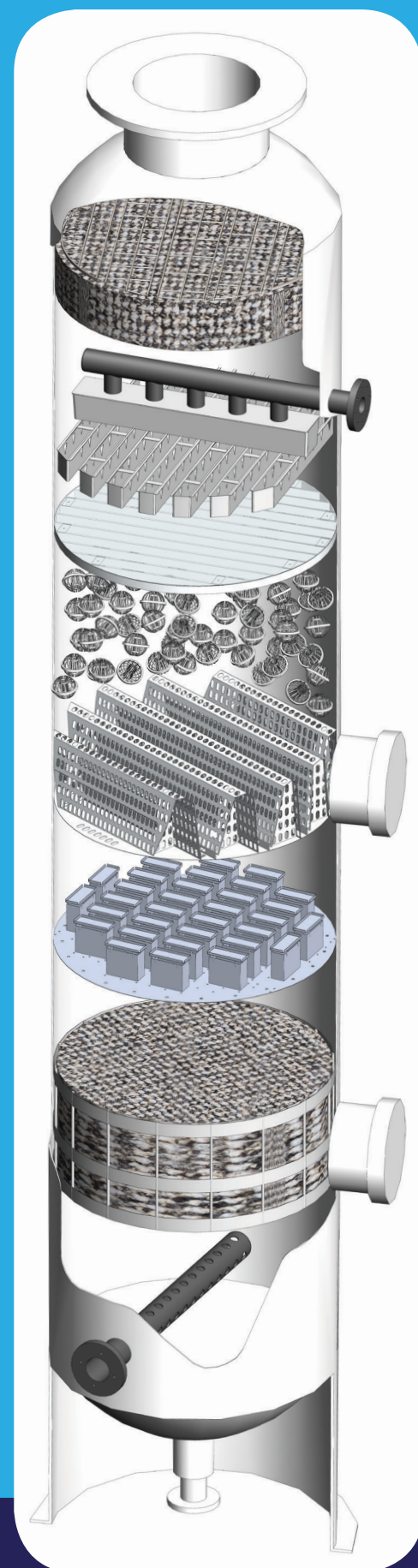
			
FEED PIPE	PACKING SUPPORT	LIQUID DISTRIBUTOR- TROUGH	BED LIMITER
			
LIQUID REDISTRIBUTOR - ORIFICE	MIST ELIMINATOR	VAPOR DISTRIBUTOR	STRUCTURED PACKING

			
TRI-PACK	MACH MINI RINGS	PALL RINGS	PLASTIC SADDLES
			
INTERPACK	VSP	CERAMIC SADDLE AND RINGS	CARBON RASHCIG RINGS

**MACH ENGINEERING, LLC**

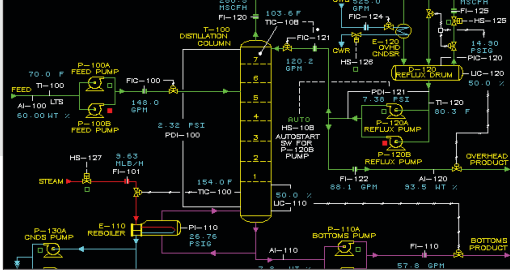
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## ENGINEERING DESIGN

### OVERVIEW



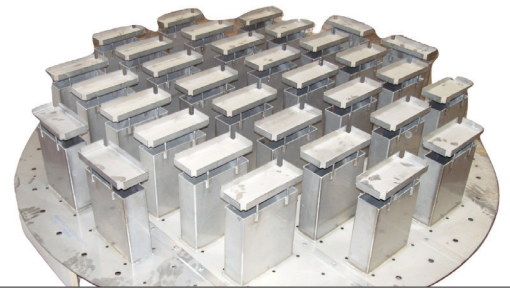
MACH performs rigorous mass and energy balance calculations for a wide range of industrial steady state processes with HETP calculations. Moreover, with the aid of Aspen Plus, we can optimize your current process in the plant, troubleshoot or debottleneck, and revamp your plant to increase productivity.

## TOWER PACKING



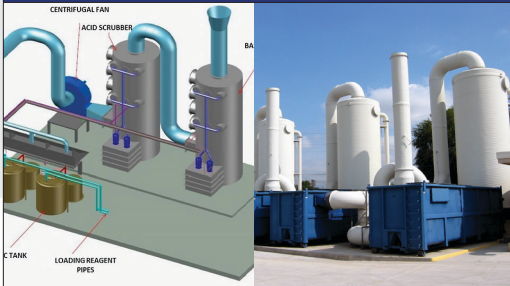
MACH offers tower packings in multiple sizes & configurations to comply with the specifics of the column. They are increasingly considered for their high efficiency in mass transfer. Packing maximizes the vapor liquid contact area, minimizes the pressure drop and ensure; uniform resistance to the flow of vapor and liquid. Packings are available in plastics, metals and ceramics.

## TOWER INTERNALS



MACH provides state of the art tower internals to help you design your column. MACH will engineer and manufacture tower internals to meet your specific design requirements. The tower internals are available in a wide variety of metals and plastics. Some of the internals that we provide are mist eliminators, liquid distributors, packing support, bed limiters and many more.

## FUME SCRUBBERS & AIR STRIPPERS



Scrubbers and Air strippers have high demand in the chemical industry. Our team's strong background in chemical engineering and expertise in process simulation, can help you design the unit most efficiently in a timely fashion. Air Strippers are commonly used in groundwater, desalination and contaminated water applications. Some common fume scrubbers are H<sub>2</sub>S Scrubber, HCl Scrubber and HF Scrubber.

## CUSTOM FABRICATION



We design and fabricate custom equipment to meet your specific needs. MACH has the capability to fabricate utilizing various metals and plastic materials such as stainless steel, aluminum, hastelloy, inconel, polypropylene, fiberglass, PVDF, CPVC, and others. For more information regarding MACH's fabrication capabilities, please contact MACH Engineering or visit our website.

## CONSULTING AND INSTALLATION SERVICES



For customers looking for assistance in developing a plan for a new project or trouble shooting an existing system or problem, MACH can help customers develop an action plan that meets their demands. Our team of engineers can also provide experienced supervision of your installation to ensure proper installation procedures are followed.

### A quick guide to approximating packing volume

$$\text{Approximate packing Volume} = \pi \times \left( \frac{\text{Vessel Diameter}}{2} \right)^2 \times \text{packing height} \times \text{settling factor} \quad \text{Where, Settling factor} = 1.03$$

## PACKING ESTIMATION TABLE

Vessel Diameter (ft)	2	4	5	8	10	12
Packing height (ft)	10	12	7	12	14	16
Appr. Packing Volume (ft <sup>3</sup> )	32.36	155.32	141.57	621.28	1132.5	1863.84
Final Volume (ft <sup>3</sup> )	33	156	143	622	1134	1865

## UNIT CONVERSION TABLE

Mass	1 kg = 2.205lb    1 lb = 453.6g lb/hr = ppm × MW × d sc f m × 1.557E - 7 Where: MW= molecular weight dscfm = gas flowrate; dry basis cubic foot per minute
Temperature	°F = 1.8°C+32
Pressure	1 atm = 14.69595 psia = 1.013 bars = 101.3 kPa 1 Pa = 1 N/m <sup>2</sup> = 10 <sup>-5</sup> bars
Volume	1m <sup>3</sup> =1000l=35.3ft <sup>3</sup> 1ft <sup>3</sup> =7.482gal
Volumetric flow rate	1 gpm=0.2271 m <sup>3</sup> /hr 1 m <sup>3</sup> /hr=4.403 gpm 1 cfm = 1.70 m <sup>3</sup> /hr
Density	Water = 62.4 lbm/ft <sup>3</sup> = 1000 kg/m <sup>3</sup> = 1 g/cm <sup>3</sup> = 8.33 lbm/US gal