

# **KLM Technology Group**

## **Practical Engineering Guidelines for Processing Plant Solutions**

### **Distillation Fundamentals Expertise**

There are many separation processes and each one has its best application. They include distillation, crystallization, membrane, and fixed bed adsorption systems. Occasionally the best system may be a combination of these systems.

The choice of the best application should be based on the life cycle cost. The life cycle cost is the initial capital cost of plant along with the first ten years operations and maintenance cost. The life cycle cost should include a reliability factor, which is very important in designing any process plant equipment, reactors or separation equipment. Improved reliability has a very large impact on return on investment (ROI). Many life cycle cost only review energy, but not solvent, adsorbent, or catalyst cost because of accounting rules and this can lead to skewed economic decisions.

Distillation may be the most economical and utilized when possible. Distillation is the separation of key components by the difference in their relative volatility, or boiling points. It can also be called fractional distillation or fractionation. Distillation is favored over other separation techniques such as crystallization, membranes or fixed bed systems when;

1. The relative volatility is greater than 1.2,
2. Products are thermally stable,
3. Large rates are desired,
4. No extreme corrosion, precipitation or sedimentation issues are present,
5. No explosion issues are present

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### Paths to Distillation Optimization

A process study is a good way to optimize a revamp or to identify opportunities of improving the performance of distillation facilities. Previous studies have identified improvements with small or no investment.

A study should be conducted jointly with the operations team to properly account for operational constraints. A clear view of unit economics should be included in the process study to maximize return on investment.

### Distillation Fundamentals Expertise

A few of the successful distillation projects we have helped implement;

1. 1988 - Reformer Stabilizer - retrayed a reformer stabilizer for increased capacity - Houston Texas, USA
2. 1991 - Aromatic Solvent Tower - retrayed an aromatic solvent tower for increased capacity and efficiency - Houston Texas, USA
3. 1992 - UDEX BTX Stripper Column - retrayed a UDEX BTX stripper tower - Houston, Texas, USA
4. 1994 - Crude Vacuum Tower - changed vacuum tower from random rings to structured packing - Houston, Texas, USA
5. 1995 - Commissioning of an Ethyl Benzene Plant - Merak, Indonesia
6. 1996 - Commissioning of an Ethyl Benzene / Styrene Monomer Plant - Panjin, China
7. 1997 - Commissioning of a EP Cracker - total of eleven columns - Sulphur, Louisianan, USA
5. 1998 - Debutanizer Column - modified the down comers for increased capacity - Sulphur, Louisiana, USA

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- 2000 - Ethylene Saturator - changed from random packing and pan distributors to grid and v-notched distributors for increased reliability - Sulphur, Louisiana, USA



- 2001 - BTX Extractive Distillation - changed trays and packing distributors for increased capacity in extractor and stripper columns- Johor, Malaysia



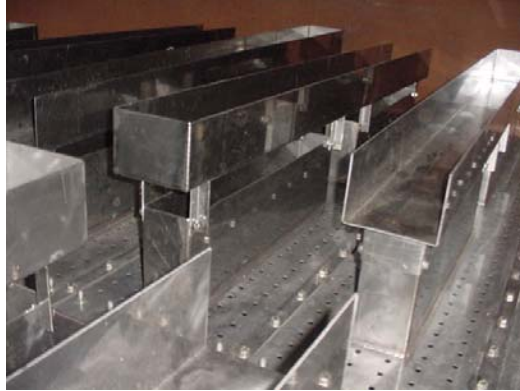
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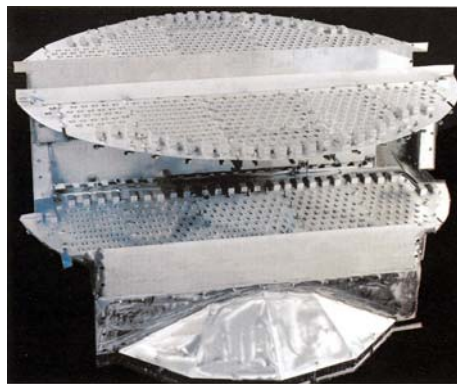
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8. 2001 - Propylene Splitter - installed redistributors to increase efficiencies - Johor, Malaysia



9. 2002 - Ethylene Quench Tower - changed from random packing and pan distributors to grid and v-notched distributors for increased reliability - Sulphur, Louisiana, USA
10. 2003 - Ethylene Quench Tower - changed from random packing and pan distributors to grid and v-notched distributors for increased reliability - Sulphur, Louisiana, USA
11. 2003 - Ethylene DeMethanizer - retrayed with high capacity trays to increase capacity - Sulphur, Louisiana, USA



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12. 2004 - Crude Vacuum Tower - upgraded distributors and packing - Singapore



13. 2004 - Specialty Chemical Unit - Retrayed dual flow trays for increased capacity, Thailand

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