GT-DWC® – Dividing Wall Column Process and Applications

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Concept of Dividing Wall Columns
Conventional Two-Column Fractionation Sequence for Separating Three Components
Thermodynamics Inefficiencies in Column 1

Composition Profile of Component A

Column 1

Feed (A,B,C)

(B,C)

Composition : Mole Fraction

Tray Number

Composition : Mole Fraction

0 0.2 0.4 0.6 0.8 1
Thermodynamics Inefficiencies in Column 1

Composition Profile of Components A, C

Column 1

Feed (A, B, C)

(B, C)

Tray Number

Composition : Mole Fraction

Composition : Mole Fraction
Thermodynamics Inefficiencies in Column 1

Composition Profile of Components A, B, C

Feed (A, B, C)
Thermodynamics Inefficiencies in Column 1

Thermodynamic inefficiency as component B is concentrated, then diluted within the first column.

Remixing leads to **Thermodynamic Inefficiency**
GT-DWC® Screening Criteria – When high-purity side product required

Conventional Sidedraw Column

Intermingling of feed with Sidedraw

Feed (A,B,C)

C

A

B

When high purity middle product is desired, GT-DWC® should be considered instead of a conventional sidedraw column.

GT-DWC®

A

B

A,B

B,C

Feed (A,B,C)

B

C

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From Prefractionator Arrangement to Dividing Wall Column

- Lower investment and energy requirements
- DWC and Petlyuk are thermodynamic equivalent
- No remixing effect
Typical Benefits of GT-DWC®

GT-DWC® CAPEX is lower by 20-30%

GT-DWC® OPEX is lower by 20-30%

Equipment Count & Plot Space

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Conventional Two Column System</th>
<th>GT-DWC®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Reboiler</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Condenser</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Pump</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Plot Space</td>
<td>100%</td>
<td>App. 30% less</td>
</tr>
</tbody>
</table>
# GTC’s Offerings for Advanced Distillation

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT-DWC®</td>
<td>General name for all dividing wall column distillation designs. In absence of further designation, this name refers to a Middle Dividing Wall Column.</td>
</tr>
<tr>
<td>GT-TDWC®</td>
<td>Dividing wall placed at top of column. Applies to three cut separations, heat integration configurations, and multi-function operations.</td>
</tr>
<tr>
<td>GT-UWC℠</td>
<td>Uniting two different functions within the same column of a TDWC configuration, such as absorption and stripping.</td>
</tr>
<tr>
<td>GT-BDWC®</td>
<td>Dividing wall placed at bottom of column</td>
</tr>
</tbody>
</table>
Improved product quality and lower energy consumption
Bottom Dividing Wall Column
High Purity Products
Top View of Dividing Wall
GTC Internal Liquid Split Distributer

- Risers for vapor flow
- Provision for external splitting for future use
- Liquid split metering box (Maintains fixed liquid ratio on either side of wall)
Operational GT-DWC® Applications

Stand-alone grassroots / revamp applications

• Case study 1: Naphtha Splitter Retrofit
• Case study 2: Original 2-Tower System revamped to GT-DWC®
• Case study 3: GT-DWC® for High Purity Products
• Case study 4: GT-UWC℠ (Uniting Wall Column) with integrated absorption/stripping for LPG Recovery
Case Study 1: Naphtha Splitter Retrofit

- Intermixing of Feed with Side Cut
- Smaller Diameter puts a restriction on Vapor/Liquid Loading

- Side cut separated from feed
- Better quality
- Cost of revamp ¼ of alternate options

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Case Study 2: Original 2-Tower System Revamped to GT-DWC®

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Case Study 2: Original 2-Tower System Revamped to GT-DWC®

Heavy Naphtha 1

Light Naphtha

Heart Cut Naphtha

Naphtha Splitter-1

Revamped to GT-DWC®

LCO

HCO

Heavy Naphtha

Naphtha Splitter II

Idled

LP Steam Generator

Heart Cut Naphtha

HCO / HP Steam

Heavy Naphtha 2

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Middle Dividing Wall Installation in South East Asia
Case Study 3: GT-DWC® for High-Purity Products

Reformate Feed

- Reformate Light Cut Column
- Reformate Heavy Cut Column
- C5 rich Cut
- C6 Rich Cut to Aromatics
- C7+ Aromatics
- Clay Treaters
- GT-DWC® Column
- Toluene
- Mixed Xylenes
- C9+ Cut

Heat Integration

New Equipment

Existing Equipment

Dividing Wall Column
TonemGeneral Xylene Recovery Unit at Chiba, Japan
Case Study 4: Conventional Design of LPG Recovery Unit

- **Off Gas (C1, C2, C4, C4, Heavies)**
- **Fuel Gas (C1, C2)**
- **450 psig**
- **DEETHANIZER**
- **LPG (C3)**
- **300 psig**
- **DEPROPanizer**
  - LPG Recovery - 55%
  - Energy - 22 MMBtu/hr

- **C4, Heavies**

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Case Study 4: GT-UWC℠ for LPG recovery
Case Study 4: GT-UWC℠ for LPG recovery

- Improved LPG recovery with no refrigeration
- Lower energy consumption
- Better heat integration options

Internal Circulation of Heavies as Absorption Solvent
Top Dividing Wall Column Installation at BPCL, India
GT-DWC®

Off Center Dividing Wall

GT-DWC℠ Trays

Testing of GT-DWC℠ Internal Liquid Split Distributer

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GT-DWC® Column Internals
GT-DWC® – Dividing Wall Column Process and Applications

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