

## CLIMATE CHANGE MITIGATION EFFORTS



**Ratheesh S**

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<b>AREAS OF INTEREST</b>	<b>Graduate in Chemical Engineering from University of Kerala with 12+ Years of experience in Process Design &amp; Development and technical services of Hydrotreating Units, Sulphur Recovery Units, Aromatic Recovery Units and Delayed Coking Units in India and abroad.</b>
<b>ACHIEVEMENTS/ AWARDS</b>	<ul style="list-style-type: none"> <li>➤ <b>Recipient of prestigious "Greentech Quality &amp; Innovation Award 2022" in Technology Innovation category</b></li> <li>➤ <b>Presented papers in various national/international forums</b></li> <li>➤ <b>Published 3 articles in various international magazines</b></li> </ul>

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## PROJECT DETAILS



<b>Project Title</b>	Climate Change Mitigation Efforts: Reduction in Emission of Green House Gases on account of Reconfiguration of Naphtha Splitters in BPCL Mumbai Refinery Using Dividing Wall Column Technology
<b>Trigger of the Project</b>	At Middle Management Level
<b>Uniqueness of the Project</b>	The innovation was unique in the following aspects: <ul style="list-style-type: none"> <li>a. Retrofitting of Dividing Wall in Existing Configuration</li> <li>b. Inhouse innovation/utilization of internal resources</li> <li>c. Implemented utilizing the planned turnaround time of the unit for Maintenance &amp; Inspection activities</li> </ul>
<b>Date of Commencement</b>	4 <sup>th</sup> September 2021 (Same as planned)
<b>Date of Completion</b>	19 <sup>th</sup> October 2021 (Same as planned)
<b>Major Milestones</b>	<ul style="list-style-type: none"> <li>a. Mechanical completion: 5<sup>th</sup> October 2021</li> <li>b. Feed cut-in &amp; Products diversion: 19<sup>th</sup> October 2021</li> <li>c. Shutdown of ISOM Naphtha Splitter Unit: 20<sup>th</sup> October 2021</li> </ul>

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## TANGIBLE BENEFITS



- Reduction in Steam Consumption: 248 Tonnes/Day
- Reduction in Power Consumption: 1132 KWh
- Reduction in Fuel Oil Consumption: 9.8 Tonnes/Day
- Reduction in Specific Energy Consumption: 0.75 MBN
- Reduction in Solomon Energy Intensity Index (EII): 1.04
- Reduction in GHG Emission: 29043 Tonnes/Annum

**Net value realization to refinery: Rs. 69.6 Crores/Annum**

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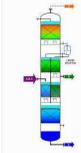
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## INTANGIBLE BENEFITS



**Sustainable Energy System**

**Increased Safety**


**Improvement in Quality of Life**

**Reputation & Skill Upgradation**



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## REPLICATION POTENTIAL WITHIN BPCL



As on date, MR has 3 DWCs

1. RFU Splitter II: For Naphtha Splitting
2. ISOM Deisohexanizer: Isomerase Splitting & Hexane Production
3. DAS Splitter in LOBS Unit: Dearomatized Solvent Splitting
  - BPCL Corporate R&D Centre is exploring the feasibility of columns that can be converted to DWCs in Mumbai, Bina and Kochi Refineries.
  - Our APC & Digital Team is in the process of developing Digital Twin models for DWCs to optimize the operation.



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## REPLICATION POTENTIAL WITHIN THE SECTOR



DWCs can be replicated within the sector for separating multicomponent mixtures into three or more high purity product streams in a single column and as an ideal alternative for revamp of side cut columns when high purity is required from the three product streams.

Presented in various National as well as International forums like Activity Committee Meet on Environment & Water Management organized by CHT, 3<sup>rd</sup> International Conference on Refinery & Petrochemical Technology Forum, 25<sup>th</sup> Energy Technology Meet, Distillation Experts Conclave etc.

Published in various National/International journals like Annual Oil & Gas Technical Journal of CHT, Chemical Engineering World, ptq magazine etc.

Won prestigious awards like Greentech Quality & Innovation Award 2022, Economic Times Ascent National Award for Technical Excellence 2022 etc.

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## CHALLENGES FACED & ACTIONS TAKEN



Sl. No.	Challenges Faced	Action Taken
1	Splitter II Overhead Air Fin Condenser is found to be limiting at Splitter II design capacity of 2710 MTPD.	<ul style="list-style-type: none"> <li>➤ Feed to Splitter II reduced to 2400 MTPD and accordingly feed to Splitter I increased to 3600 MTPD.</li> <li>➤ Splitter II Overhead AFC blade angle increased from 3° to 18°</li> </ul>
2	Tuning of controllers were required for running in Cascade mode.	APC strategy formulated and implemented in RFU for post reconfiguration scenario.
3	Feed Pump was found to be running at a current close to Full Load Current at design flow rate.	<ul style="list-style-type: none"> <li>➤ Feed Surge Drum pressure maintained at 4 kg/cm<sup>2</sup> g to reduce current.</li> <li>➤ Change of impeller of the pump in consultation with OEM</li> </ul>

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## ACHIEVING NATIONAL BENCHMARKS



Parameter	Traditional Columns	Dividing Wall Columns
Capital Cost	High	40% Lower
Energy Consumption	High	30% Lower
Water Consumption	High	20% Lower
GHG Emission	High	Low
No. of Equipments	More	50% Less
Plot Requirement	More	Less
Manpower Requirement	More	Less
Product Purity	Moderate	High
Turnaround Time	More	Less

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**ONGOING DEVELOPMENTS / FUTURE PLANS**



<b>Development of Digital Twin model for optimization of DWC operation</b>	<b>Identification of columns that can be converted into Dividing Wall Columns within BPCL Group Refineries</b>
<b>Collaboration with M/s. EIL for marketing of Dividing Wall Column Technology developed by BPCL Team</b>	<b>Organizing knowledge sharing platforms to promote industries to adopt more sustainable energy systems with less Carbon emissions</b>

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**TOP TEN BEST PRACTICES**



- Meticulous planning
- Deployment of skilled manpower
- Construction safety management
- Use of digital tools
- Prompt decision making
- Excellent teamwork
- Effective communication
- Setting realistic milestones
- Regular monitoring
- Proper documentation

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## MAJOR LEARNINGS



- Placement of Purchase Orders for the procurement of long lead items shall be done well in advance.
- Defining the team and the process for decision-making is of utmost importance.
- Resource management & regular reviews play paramount role in project success.
- Deployment of skilled manpower can save project implementation time to a great extent.
- Optimal use of digital technology in planning, inspection etc. and use of drones for safety surveillance.
- Ensure availability of proper documents during the construction stage.
- Document the learnings assimilated throughout the lifecycle of the project.

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