Hot Water
Vapour Absorption Chiller
15 TR to 1525 TR (50kW to 5350kW)
Cooling & Heating Division - Cooling SBU

The Cooling SBU of THERMAX promotes Vapor Absorption Chillers as a cost effective and environment friendly alternative to electricity driven compression chillers.

It offers expert solutions in Process Chilling & Air Conditioning for industrial as well as commercial applications. Cooling SBU’s strengths lies in customized solutions as per the requirements of its customers.

Unlike electrical chillers, Absorption Chillers are powered by heat. These machines can run on a variety of heat sources, e.g., steam, hot water, liquid/gaseous fuels, exhaust gases and/or a combination of above.

Thermax - Conserving Energy, Preserving the Environment

Vapor Absorption Technology from Thermax is at work for clients in more than 50 industries including Pharmaceuticals, Chemicals, Fertilizers, Steel, Textiles, Petrochemicals, Food & Beverages and Automobile Industries as well as in Hotels, Commercial Complexes, Shopping Complexes, Office Buildings, Educational Institutes, Airports, Cinema halls and Medical Centers.

Manufacturing capabilities of Thermax’s Cooling SBU are confirmed by the fact that, over the years, Thermax has installed thousands of machines in more than 70 countries including USA, Brazil, Germany, Spain, UK, Italy, UAE, Saudi Arabia, India, China, Australia, Thailand, Philippines, Malaysia, Russia and Nigeria with the products conforming to the respective country standards like ETL, CE, TUV, DNV, ASME etc. Thermax has its fully owned subsidiaries namely Thermax Inc. in USA, Thermax Europe Limited in UK and Thermax (Zhejiang) Cooling and Heating Engg. Company Limited in China.

Thermax believes in efficient and responsive services to it’s clients and exhibits in it’s way of business, by giving optimal and quality solutions and achieving customer delight. Thermax has a worldwide sales, service and distribution network to fulfill the needs of it’s valuable customers.

Vision

To be a globally respected high performance organization offering sustainable solutions in energy and environment.

Sustainable Solutions

From Cooling to Heating, from Power Generation to Air Purification, from Water and Sewage Treatment to Speciality Chemicals. THERMAX Solutions are improving life at work in many ways.

Every year THERMAX helps generate 6,000 MW of Power, produce 100,000 tons of steam, provide 4 billion tons of Cooling and treat 1,000 million litres/day of Water and Waste.

THERMAX today is a major Engineering and Environment company with revenues of USD 800 million and with market capitalization of over USD 1 billion.

THERMAX was one of 20 Indian companies in Forbes list of “Asia’s Best Under a Billion Companies” in 2005 and 2006 and was ranked “No. 1 among the top 21 wealth creators” in India over the last 5 years by a leading Investment journal.

THERMAX brings to customers enriched experience of industrial applications, and expertise through technological partnerships and strategic alliances.

Operating from its Headquarters in Pune (Western India), Thermax has built an international sales & service network spread over South East Asia, Middle East, Africa, Russia, UK, US and China. It has full fledged ISO 9001:2000 and ISO 14000 accredited manufacturing setups.
Manufacturing & Testing

Thermax manufactures environment friendly and energy efficient vapor absorption chillers at its plant in Pune, India and China. Its state-of-the-art manufacturing facility is awarded with ISO 9001 and ISO 14001 certifications. Stringent quality control procedures along with a skilled workforce ensure that a highly reliable product leaves the factory. The equipment and manufacturing processes conform to International standards.

Thermax Pressure part manufacturing has been approved by ASME and bears S, U, H, R stamps. The Vapor absorption chillers are CE certified for European Union and ETL listed for US and Canadian market. They confirm to the Kyoto Protocol & are in absolute tandem with Clean Development Mechanism Code (CDM). Thermax also confirms to Environmental Management System standard 14001 & OHSAS 18001.

CNC twin spindle drilling machine with high speed and direct feed technology ensures fine tube hole finish and accuracy, which is important for leak tight expansion and effective heat transfer.

A Helium leak detection test ensures there is no leak at welding joints.

Welding robot for high precision automatic welding.

CNC gas cutting machine for plate cutting ensures precision cutting of shell plates and profile cut tube plates.

Press Brake Machine
Salient Features

- **Unique two stage absorption technology**
  Thermax chillers are designed based on unique two stage absorption technology, with two stage evaporation and two stage condensation.
  Benefits:
  - Higher COP (0.75 to 0.8) even at low hot water outlet temperature.
  - Larger temperature difference on both chilled water and hot water circuits.
  This ensures that the specific heat input is one of the lowest in the industry, resulting in higher cooling output from the same heat input.

- **Isolation valves**
  Double seal isolation valves and bolted pumps facilitate easy maintenance of machine mounted canned motor pumps without any loss of vacuum in the system by avoiding exposure to atmosphere.

- **Lowest chilled water/brine temperature**
  Thermax chiller can deliver chilled water temperatures down to 3.5°C (38.3°F) and chilled brine solution down to 3.5°C (32°F) enabling absorption chillers to be used for applications where low chilled water/brine temperatures are required.

- **Non-Toxic corrosion inhibitor**
  Thermax chillers use new generation non-precipitating, non-toxic molybdenum based corrosion inhibitor which is more effective than conventional inhibitors based on chromate and nitrate which are carcinogenic in nature and are prohibited in several countries.

- **De-oxidised low phosphorus copper tubes**
  Copper tubes conforming to ASTM/JIS standards, with phosphorus content maintained below 0.005 ppm, are used in chilled water and cooling water circuits. This protects the tubes from hydrogen embrittlement in LiBr environment.

- **PLC based control panel**
  Thermax chillers are provided with state-of-the-art PLC based control panel, user friendly operator interface and data logging system.

- **Low installation space**
  Thermax absorption chillers are designed in such a way that they have the smallest footprint amongst the contemporary chillers available in the market without compromising the ease of maintenance. This feature makes it an ideal choice for basement installation, easy access to the basement, replacement jobs etc. Also the chillers can be shipped in multiple pieces further enhancing the ease of transportation and installation.

- **BAS/DCS connectivity**
  Direct connectivity of PLC panel with Third party monitoring systems like BAS (Building Automation System), DCS (Distributed Control System) or PLC (Programmable Logic Controller) can be provided via Modbus RTU protocol on RS485 network.

- **10-100% stepless modulation**
  For cooling loads ranging from 10% to 100% of the designed capacity of the chiller, the 3-way diverting valve automatically varies hot water flow in order to maintain the temperature of chilled water leaving the chiller. This ensures better part load performance.

- **On-line purging**
  Thermax chillers come with factory fitted high efficiency purge system, which continuously removes non-condensable gases from the chiller into the storage tank, while in operation.

Instrumentation and Safety Features
Customized Features

- Zero crystallisation

Unique state-of-the-art concentration control and display that practically eliminates crystallization and is distinctly different from the auto decrystallization offered by other manufacturers. This permits the VAM to operate even at 10°C cooling water inlet temperature.

- Variable Frequency drive

Variable frequency control on absorbent pump for higher reliability & savings in power, especially during part load operation.

- Scheduler

Operation of chiller based on working hours / days can be defined, thereby reducing manual intervention.

- Connectivity

Connectivity to third party monitoring systems can also be provided via Profibus, Ethernet or BacNet.

- Customised tube metallurgy

Special tube materials like Cupro Nickel, SS-316L, Titanium depending on water quality on site. This not only improves the reliability and efficiency but also makes the chiller suitable for special applications involving sea water and brackish water.

- Remote Performance Monitoring System (RPMS)

Advanced feature that monitors the chiller performance and provides data via Internet. This feature enables the facility manager or Thermax engineer to monitor the performance remotely. It also offers features like e-Log book, status, trends, maintenance schedules, alerts etc.

- Multi-sectional Shipment Arrangement

For convenience of shipping and rigging, the Absorption Chillers can be shipped in two or more sections depending upon the site requirements. This is particularly convenient for retrofit jobs.
## Operating Principle

1. When maintained at high vacuum, water will boil and flash cool itself.

2. Concentrated Lithium Bromide solution has affinity towards water. The solution absorbs vaporized refrigerant water.

3. As Lithium Bromide becomes dilute it loses its capacity to absorb water vapor. It thus needs to be reexternally using a heat source.

4. This heat causes the solution to release the absorbed refrigerant in the form of vapor. This vapor is cooled in a separate chamber to become liquid refrigerant. The Concentrated LiBr is sprayed back in absorber.

## Cycle Diagram

[Diagram showing the cycle of the operating principle with labels for strong and weak solutions, refrigerant liquid, chilled water, cooling water, and hot water.]
Holistic Customer Care

Cooling Unit of C&H division has a wide network of Service Centers throughout the globe to ensure quick response to customers. With a cumulative service experience of over 4000 VACs operating for more than 25 years, Thermax service personnel are equipped to deliver the right solution to the users. Thermax has developed specific modules for different types of users depending on their usage pattern, conforming to our proactive approach.

For the benefit of its customers Thermax offers various value added services like:

- Preventive maintenance contract
- Operations & manning
- Localized customer training programs

Testing Procedure

As the Vapor absorption chillers work under vacuum conditions, the manufacturing of these chillers is very critical with respect to leak tightness. Hence it is necessary to follow stringent quality control procedures and also perform leak detection test. Understanding the importance, Thermax carries out the leak detection test in the following sequence:

- **Helium shroud test:**
  
  In this test, the chiller is fully covered by a polythene sheet and helium is passed from below, to observe the cumulative leak rate of the entire chiller. It can detect leakage to the tune of $5.0 \times 10^{-7}$ std cc/sec.

- **Helium spray test:**
  
  Helium, the next smallest molecule after Hydrogen, can leak through very minute holes. In this test helium is sprayed on all the joints of the chiller. As the chiller is under vacuum conditions, leakages, if any, will result in helium entering into the chiller and thus will be displayed on the screen of helium leak detector. Every machine has to clear this test before it is shipped to the customer.

Performance Testing Facility

Thermax has a state-of-the-art test bay capable of testing various types of vapour absorption chillers - steam driven, hot water driven, fuel fired, exhaust driven and a combination of these up to a capacity of 3500 TR (12300 kW). The entire testing facility is centrally operated by sophisticated Distributed Control Systems (ABB make) and can be operated by the touch of a button.

- **Steam:** 50 - 3500 TR (175 kW to 12300 kW)
- **Exhaust:** 50 - 3500 TR (175 kW to 12300 kW)
- **Hot Water:** 10 - 1730 TR (35 kW to 6080 kW)
- **Fuel Fired:** 50 - 3000 TR (175 kW to 10540 kW)

This is one of the largest testing facility for absorption chillers available in the world.
Specifications 5G Series - 15 TR to 200 TR

<table>
<thead>
<tr>
<th>Model Number</th>
<th>UNIT</th>
<th>5G 1AC</th>
<th>5G 1B C</th>
<th>5G 2AC</th>
<th>5G 2B C</th>
<th>5G 3AC</th>
<th>5G 3B C</th>
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<tr>
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<td>TR</td>
<td>15</td>
<td>31</td>
<td>47</td>
<td>60</td>
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<td>74.0</td>
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<td>6.9</td>
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<td>4.9</td>
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<td>NPS</td>
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<td>3</td>
<td>4</td>
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<td>140</td>
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<td>11.5</td>
<td>11.8</td>
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<td>8</td>
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<tr>
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<td>9.2</td>
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<td>Overall Dimensions Length (L)</td>
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<td>94.5</td>
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<td>Width (W)</td>
<td>Inches</td>
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<td>65.6</td>
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<td>Height (H)</td>
<td>Inches</td>
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<td>86.6</td>
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<td>Max Shipping Weight</td>
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<td>9.7</td>
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<td>Operating Weight</td>
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<td>Clearance for Tube Removal</td>
<td>Inches</td>
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<td>83.1</td>
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<td>Refrigerant Pump kW (A)</td>
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<td>0.1(0.55)</td>
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<td>Total power consumption KVA</td>
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<td>Power Supply</td>
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</table>

Notes:
1) Model Nos: 5G XX, Low Temperature Hot Water Chiller
2) Chilled water inlet / outlet temperature = 34 / 44 °F
3) Cooling water inlet / outlet temperature = 85 / 89 °F
4) Hot water inlet / outlet temperature = 195 / 195 °F
5) Maximum Chilled water outlet temperature is 34.5°F
6) Minimum Cooling water inlet temperature is 89°F
7) Ambient condition shall be between 41 to 113°F
8) Maximum allowable pressure in chilled / cooling / hot water system = 115 psig.
9) Control panel Electric input = KVA.
10) All Water Nozzle connections to suit ASME B15.3 Class 150
11) Above Specifications are valid for insulated machine.

Foundation Drawing

<table>
<thead>
<tr>
<th>Model</th>
<th>&quot;L&quot;</th>
<th>&quot;W&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;CTC&quot;</th>
<th>&quot;T&quot;</th>
<th>x1000lb</th>
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<tr>
<td>5G 1A</td>
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<td>5G 2B</td>
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<td>5G 2E</td>
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<td>5G 3B</td>
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<td>46.9</td>
<td>43.0</td>
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Typical General Arrangement

![Diagram of Typical General Arrangement](image)

Typical System P & I Diagram

![Diagram of Typical System P & I](image)
### Specification 5G Series - 224 TR to 1525 TR

#### Cooling Capacity

<table>
<thead>
<tr>
<th>Model Number</th>
<th>UNIT</th>
<th>5G3LC</th>
<th>5G5MC</th>
<th>5G7KC</th>
<th>5G9LC</th>
<th>5G11MC</th>
<th>5G13MC</th>
<th>5G15MC</th>
<th>5G17MC</th>
<th>5G19MC</th>
<th>5G21MC</th>
<th>5G23MC</th>
<th>5G25MC</th>
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<td>TR</td>
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<td>672</td>
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<td>885</td>
<td>1042</td>
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<td>1406</td>
<td>1525</td>
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<td></td>
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</tr>
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</table>

#### Chilled Water Circuit

| Flow Rate | gpm  | 1606  | 1754.2 | 2115.1 | 2284.7 | 2497.4 | 2610.0 | 3025.6 | 3369.7 | 3643.0 |
| Pressure loss | ft WC | 15.3 | 16.1 | 14.5 | 14.8 | 15.5 | 14.7 | 15.1 | 24.4 | 25.4 |
| Connection Diameter | NPS | 10.0 | 12.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |

#### Cooling Water Circuit

| Flow Rate | gpm  | 2995  | 3275  | 3885  | 4200  | 4587  | 5200  | 5557  | 6167  | 6720  |
| Pressure loss | ft WC | 20.0 | 21.2 | 31.7 | 33.8 | 34.8 | 29.8 | 30.2 | 45.2 | 47.9 |
| Connection Diameter | NPS | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |

#### Hot Water Circuit

| Flow Rate | gpm  | 2170  | 2356  | 2800  | 3044  | 3349  | 3730  | 4057  | 4518  | 4840  |
| Pressure loss | ft WC | 11.5 | 11.7 | 14.9 | 15.6 | 16.5 | 15.8 | 16.2 | 25.6 | 26.6 |
| Connection Diameter | NPS | 10.0 | 12.0 |

#### Overall Dimensions

| Length (L) | inches | 258 | 264 | 278 | 293 | 349 | 389 | 429 | 479 | 546 |
| Width (W)  | inches | 96  | 96  | 113 | 113 | 113 | 113 | 113 | 113 | 113 |
| Height (H) | inches | 134 | 134 | 145 | 145 | 145 | 145 | 145 | 145 | 145 |

#### Max Shipping weight

| x 1000 lb | 54.0 | 55.5 | 70.9 | 72.5 | 74.7 | 87.5 | 90.1 | 99.8 | 102.7 |

#### Operating weight

| x 1000 lb | 65.9 | 68.1 | 88.4 | 90.8 | 94.1 | 111.5 | 115.0 | 126.5 | 130.9 |

#### Clearance for Tube Removal

| inches | 264 | 264 | 273 | 273 | 273 | 273 | 324 |

#### Electrical data

| Absorbt Pump | kW (A) | 6.6 | 6.6 | 4.5 | 4.5 | 5.5 | 5.5 |
| Refrigerant Pump | kW (A) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Purge Pump | kW (A) | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Total power consumption | kVA | 20.0 | 16.8 | 18.4 |

**Power Supply**

460 V (±10%), 60 Hz (±5%), 3 Phase+N

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**NOTES:**

1) Model Nos.: 5G XX - C Low Temperature Hot water fired Twin type Chiller
2) Chilled water inlet / outlet temperature = 64 / 44°F
3) Cooling water inlet / outlet temperature = 85 / 97.5°F
4) Hot water inlet / outlet temperature = 195 / 185°F
5) Minimum Chilled water outlet temperature is 38.5°F
6) Minimum Cooling water inlet temperature is 58°F
7) Ambient condition shall be between 41 to 113°F
8) Maximum Allowable pressure in chilled / cooling / hot water system = 115 Psig
9) Control panel Electric Input = 1kVA
10) All Water Nozzle connections to suit ASME B16.5 Class 150.
11) Above Specifications are valid for insulated machine.
Foundation Drawing

Note: 1. The above drawing indicates the dimensions of the equipment base frame and foundation bolt pockets and suggested size of the footings.
2. The foundation shall be designed to suit the soil conditions and other design considerations at site.
3. For project specific data, please contact Thermax representative.

Scope of work

<table>
<thead>
<tr>
<th>Item / Activity</th>
<th>Thermax</th>
<th>Customer</th>
<th>Remarks</th>
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<td>Chiller Manufacturing with Accessories</td>
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<td></td>
<td>Refer to scope of supply in the offer</td>
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<td>Testing</td>
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<td>Factory Testing</td>
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<td>Thermax Optional Feature</td>
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<td>On-site Erection</td>
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<td>✔</td>
<td>Customer to assist, Thermax Representative will supervise the commissioning</td>
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<td>Supervision of commissioning</td>
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<td>✔</td>
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<td>Civil Foundation</td>
<td>✔</td>
<td>✔</td>
<td>Refer to scope of supply in the offer</td>
</tr>
<tr>
<td>Piping outside Battery Limits *</td>
<td>✔</td>
<td>✔</td>
<td>Refer to scope of supply in the offer</td>
</tr>
<tr>
<td>Chiller Insulation *</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Electrical Connections outside Battery Limits</td>
<td>✔</td>
<td>✔</td>
<td>For Multi-Sectional Shipment (Optional).</td>
</tr>
<tr>
<td>Assembly and On-site Connections</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Operation and Maintenance</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Training of Customer’s Operators during commissioning</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Operation</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

Note: * Indicates that the scope of supply can also be included by Thermax, as an option.
Automotive:
BMW, Germany
Ducati, Italy
Maserati, Italy
Honda Cars, India

Hospitality & Real Estate:
Fort Knox, USA
Paramount Pictures, USA
BBC Studios, UK
Citibank, UK

Educational Institutes:
University of Toledo, USA
University of IOWA, USA
Tufts university, USA
University of Potenza, Italy

Hospitals:
Alder Hey Hospital, UK
Sivas Hospital, Turkey
Bologna Hospital, Italy
Mistelbach Hospital, Austria

Food and Beverage:
Alpro, France
Ferrero, France
Phoenix Beverages, USA
Nestle, Russia

Engineering:
Rudis D.O.O., Slovenia
Siemens, Italy
Doherty Engineering, Canada

Paper and Packaging:
Modern Karton, Turkey
Anadolu Ipilık, Turkey
Polypex, Thailand

Others:
Lego, Hungary
Maklada Prestressed Steel, Tunisia
Micelin Tyres, France
Gardens by the Bay, Singapore

Airports:
Bologna Airport, Italy
Venice Airport, Italy
Liege Airport, Belgium
Istanbul Ataturk Airport, Turkey

Chemicals & Refineries:
Reliance Industries, India
Saudi Kayan, KSA
RP Chemicals, Malaysia
Solvay Specialities, India
Global Quality Standards

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