Ground Source Heat Pumps Serve A Large Processing Plant

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Project Background

- Carbonate and non-carbonated drink (milk, fruit Juice)
- Daily production (peak) of 1.2 million bottles
- New plant with building space of 320,000sft
- Thermal demand: 614 tons (2.16MW)
Conventional Design

- Electric chillers: space cooling/chilled water for processing
- City steam/natural gas boiler: space heating, water heating, waste water treatment
SOW and Contractors

- Work scope: Design and Build
- Contractors: Asia Clean Capital (Hong Kong)/Asia Clean Utility Solutions (Beijing)
- Equipment: TRANE
Plant Thermal Demands

- Heating:
  - Water heating and syrup preparation
  - Hot water for cleaning
  - CO2 vaporization
  - Melting of fruits fresh
  - Wastewater heating (bio processing)
- Cooling
  - Processing chilled water
  - Space conditioning
### SWIRE NANJING PLANT GEOTHERMAL SYSTEM

**Refrigerant Loop**

**Water Loop**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Valve A1, A2</th>
<th>Valve B1, B2</th>
<th>Valve C1, C2</th>
<th>Valve D1, D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditioning/production chilled water only</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Conditioning/production water pre-heating only</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Both chilled water and water heating</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

- **Water pumps**: Chilled water (200 usrt, 5-7°C) to buffer tank for production or air conditioning
- **Chilled water return (10-12C)**
- **Underground heat exchanger**
- **Valve A1**, **A2**, **B1**, **B2**, **C1**, **C2**, **D1**, **D2**
- **Pre-heating return**
- **Water pre-heating to 55°C, 50 ton/hr**
- **Plate heat exchanger (optional, when super-clean water is required)**

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**Heat pump 1**: comp - cond - evap

**Heat pump 2**: comp - cond - evap

**Heat pump 3**: comp - cond - evap

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The image illustrates a geothermal system with various valves and components such as water pumps, heat pumps, and underground heat exchangers. The table outlines the operations and corresponding valve settings for different scenarios, including chilling and pre-heating conditions.
Loop Functions

- Seasonal storage (Single output)
- Hourly buffering (Dual output)
Ground Loops

- Ground source: closed vertical loop
- Number of boreholes: 800
- Depth of borehole: 150ft
Loop Installation
Mechanical System
Mechanical System
Processing Requirements

- Temperature fluctuation
- Quick response to processing demand
- Operation and control System
Industrial and Commercial

- Constant demand and longer operation hours
- Improvement in production efficiency and quality
- Large scale application with lower unit cost
- Significance in energy and environmental
- Opportunities for energy management contract