9(b). what is OTEC? with the help of a schematic diagram, explain a Rankine cycle otec plant.

OTEC (Ocean Thermal Energy Conversion) is a method of generating electricity using the temperature difference between warm surface water and cold deep water in the ocean. It utilizes a Rankine cycle, a thermodynamic cycle commonly used in power plants, to convert thermal energy into mechanical work and then into electricity. While I can describe the Rankine cycle OTEC plant, I'm unable to provide a schematic diagram. However, I'll explain the process step by step:

1. Warm Surface Water Intake: The OTEC plant is located in an area with a significant temperature difference between surface water and deep water. Warm surface water, typically around 20-25°C (68-77°F), is drawn into the system through a pipe.

2. Heat Exchange: The warm surface water is passed through a heat exchanger where it transfers heat to a working fluid with a lower boiling point, such as ammonia or a refrigerant. The heat exchanger vaporizes the working fluid by absorbing heat from the warm water.

3. Turbine: The vaporized working fluid expands and drives a turbine. The turbine is connected to a generator, which converts the mechanical energy from the turbine into electricity.

4. Cold Water Intake: The vaporized working fluid, after passing through

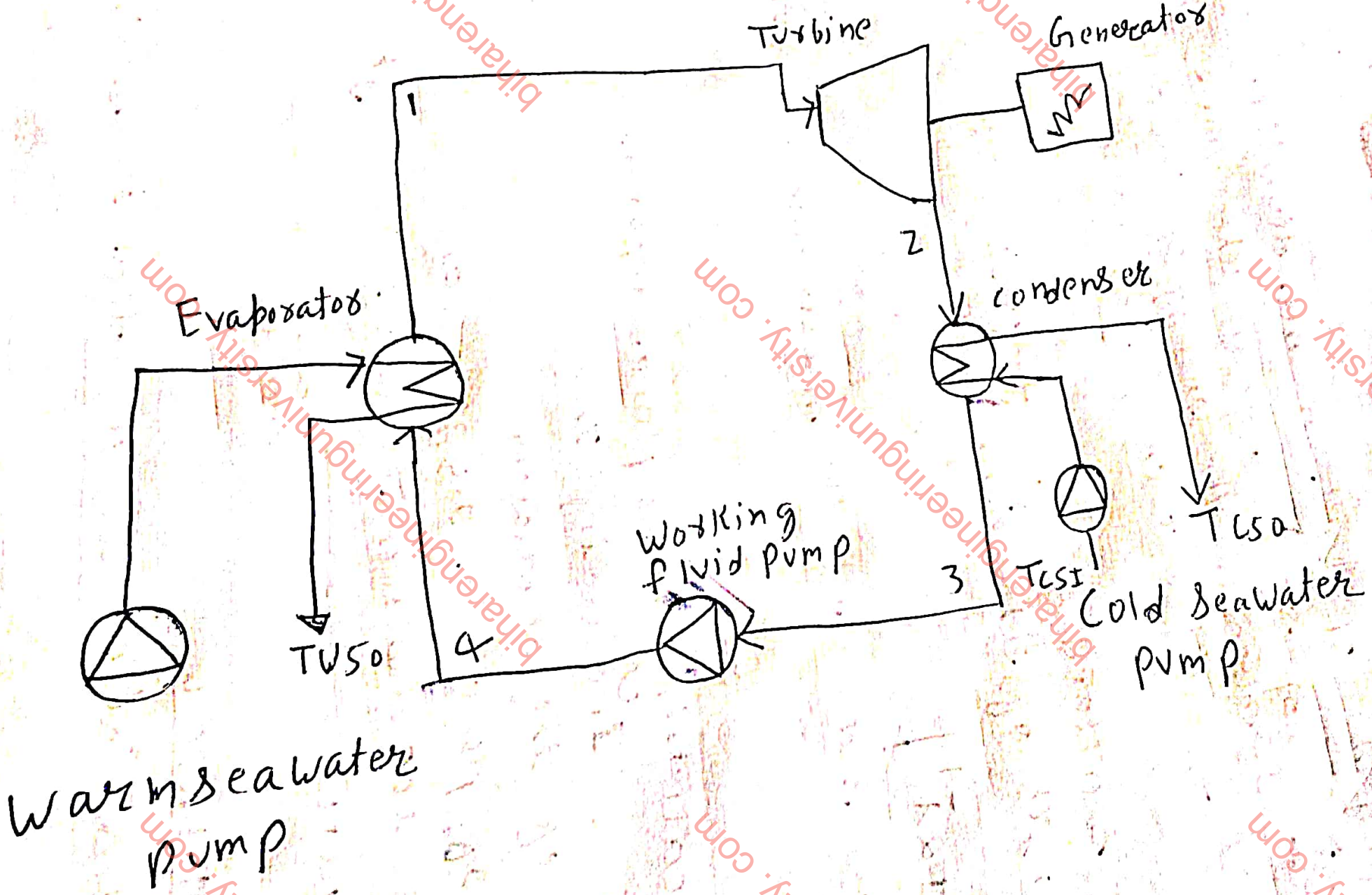
the turbine, enters a condenser. Cold water, usually around 5-10°C (41-50°F), is pumped from deep ocean depths and circulated through the condenser.

5. Condensation: The vaporized working fluid is condensed back into a liquid state by transferring heat to the cold water in the condenser. As it condenses, the working fluid releases heat, which is carried away by the cold water and returned to the deep ocean.

6. Pump: The liquid working fluid is then pumped back to the heat exchanger to repeat the cycle.

7. Power Generation: The rotation of the turbine connected to the generator produces electricity. This electricity can be used to power various devices or fed into the grid for distribution.

The Rankine cycle OTEC plant operates based on the principles of heat transfer, phase change, and the conversion of thermal energy to mechanical work and electricity. By utilizing the temperature difference between warm surface water and cold deep water, OTEC harnesses the renewable energy potential of the ocean to generate electricity.


Turbine
Generator
1
2
Evaporator
condenser
Working
fluid pump
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4
TCSI
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Cold Seawater
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Warm seawater
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