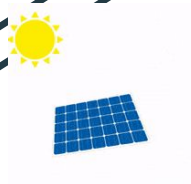
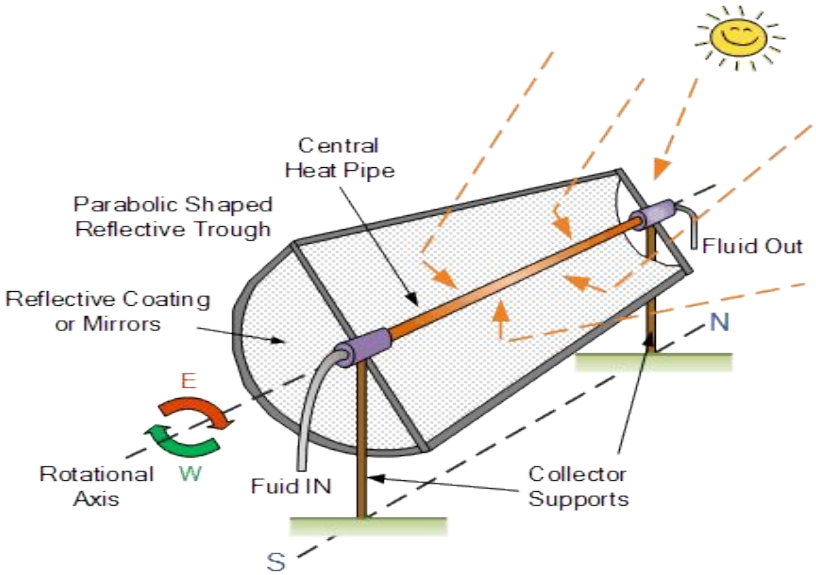


Solar Still Using Active Mirrors

Catherine Lu, Yue Hua Li, Sarah Liu, Shahmeer Tasaddaq

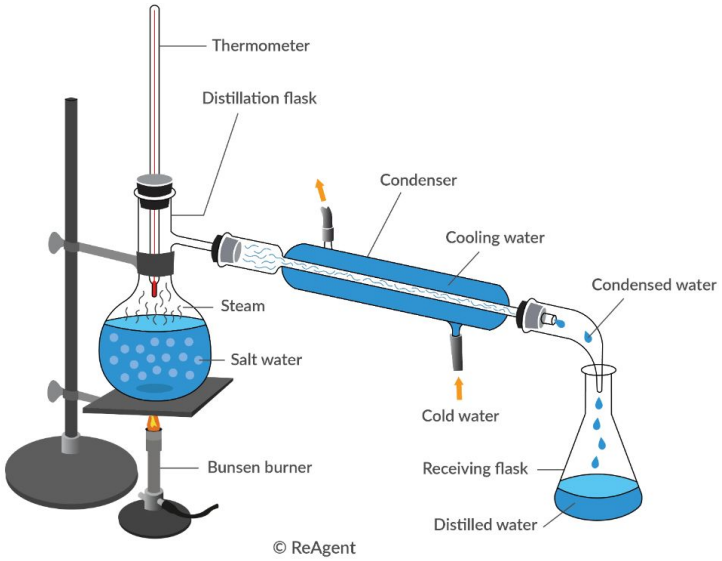
Project Scope

- **Solar Energy:** Maximization of captured thermal energy from solar power
- **Active Mirrors:** Control system of the mirrors based off of solar positions
- **Distillations:** Design of distillation system to maximize captured freshwater



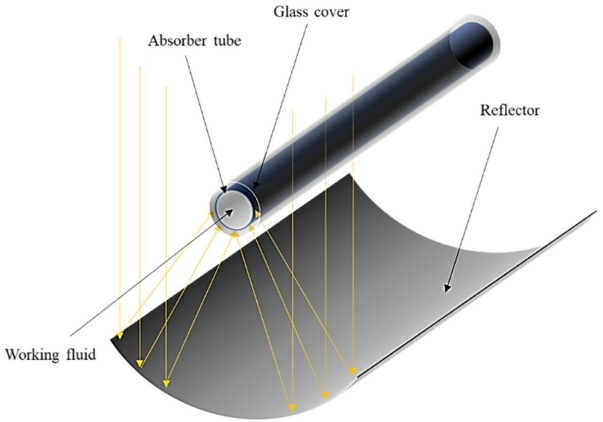
Goals (Overall)

- Minimizing energy loss during heating process by choice of materials
- Maximize the capacity of total water distilled based on overall requirements of the system



Goals (short-term step-by-step)

- Maximize water capacity based on scope/size of impact
- Narrow down types of condensers for our purposes
- Determining focal line (from the parabolic trough)
- Materials for mirrors and pipes based on requirements
- Total Energy Requirements
- Measurements Integrations (Thermocouples, Pyrheliometer, Water levels, etc.)



Requirements

Materials : Pipes, Mirrors

Energy requirements : Solar, Power for pump, Distillation angle, Mirror angle

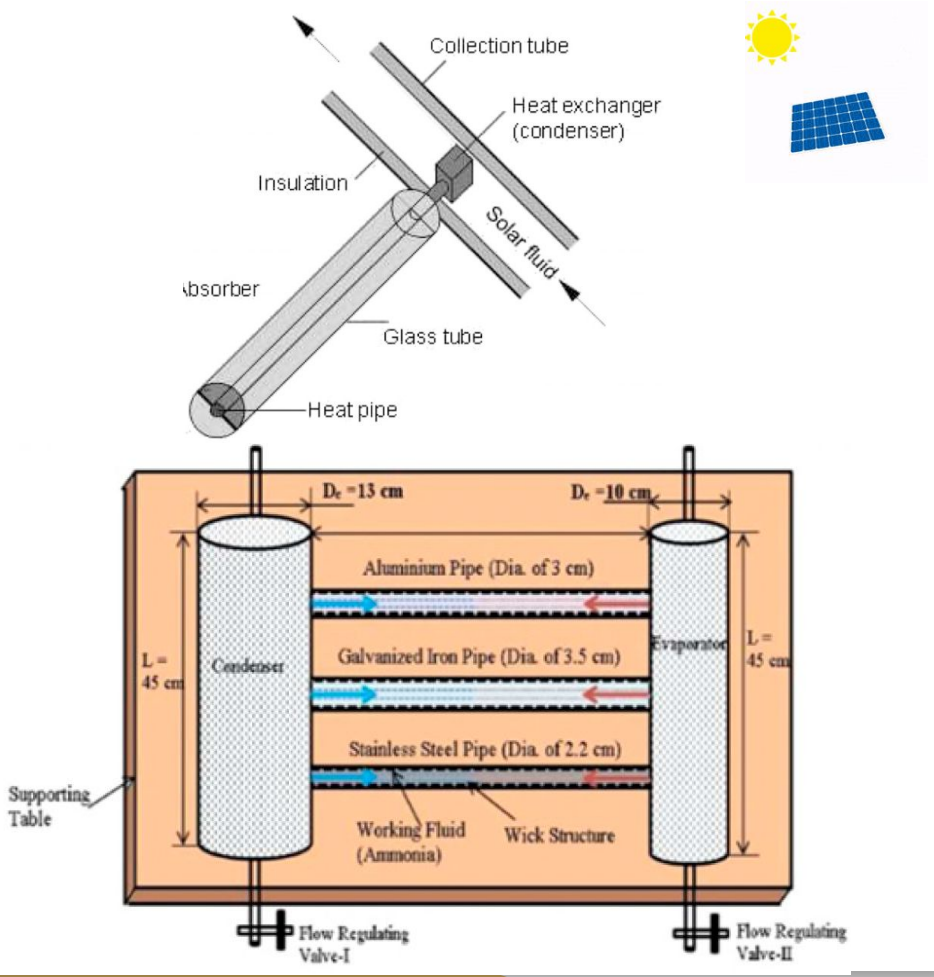
Location : NYC, Manhattan, Harlem, Brooklyn Bridge

Condenser

Accessibility, Portability : Take into account assembly/ disassembly for use

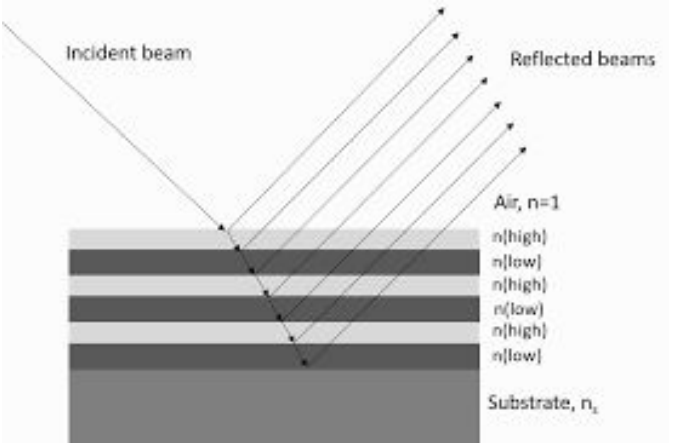
Material Requirements

- Thermal Efficiency
- Focuses on the overall loss factor including loss of convection, conduction, and radiation.
- Continuously recirculating the working fluid through temperature variation
- Corrosion Resistance
- Material Choices: Stainless steel, Copper, Galvanized iron
- Insulation - minimizing the losses



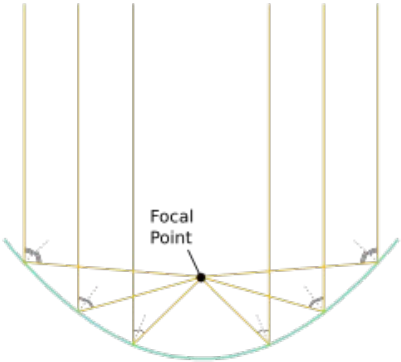
Material Requirements

- Optical efficiency will depend on:
  - The mirror reflective
  - Transmission
  - Receiver absorption
  - Intercepting factor
  - Geometry Factor
  - Incidence angle
- Higher Reflectance
- Reduce absorption (glass thickness)



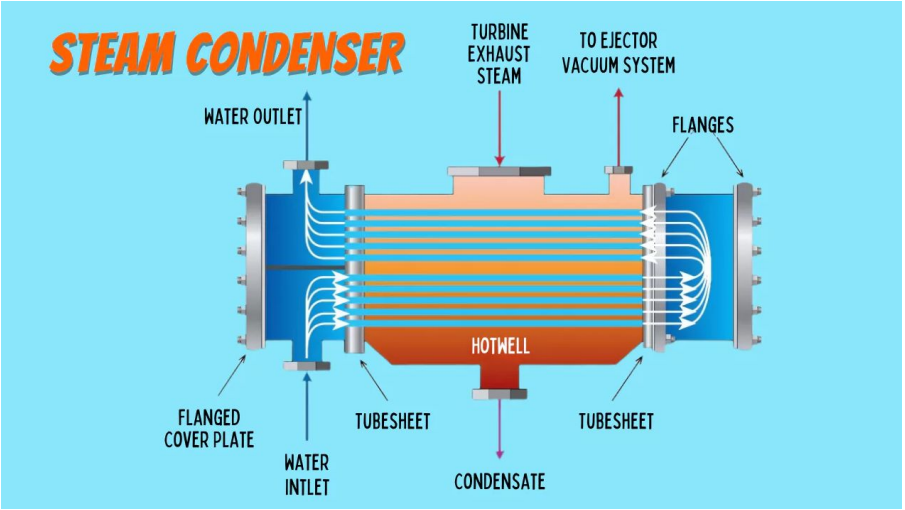
Energy Requirement

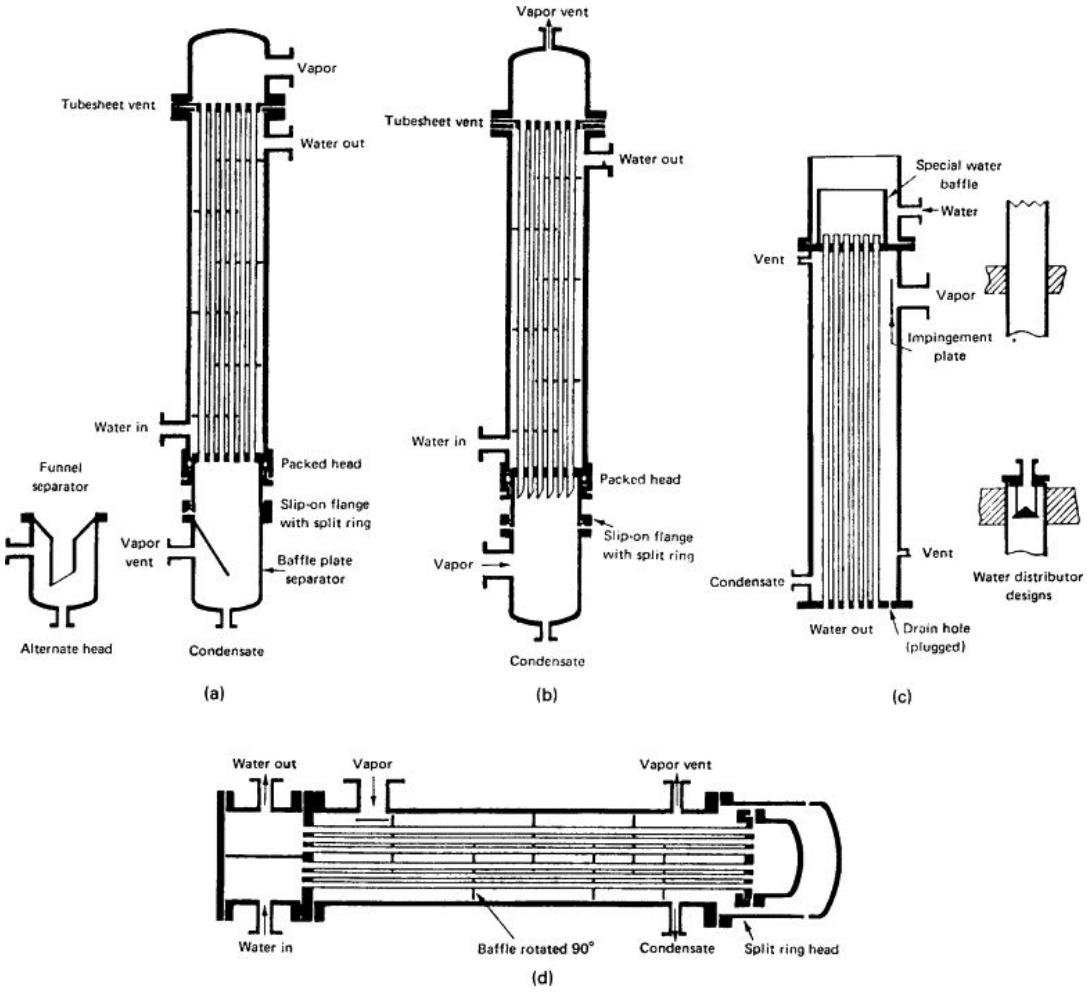
- Two different Energy Calculations Required
- Focal Point Energy Calculations
  - The energy collected by the parabolic mirror
- Energy/Power Required to operate the Whole System
  - Power required by the pump to pump water
  - Power Required by the Condenser
  - Power Required to move the mirror
- Solar panel required to operate the whole system



Condenser

- Horizontal vs vertical condensers
  - Reflux (vent/knockback) condenser
- Steam condensers:
  - Surface vs jet




Vapor
Tubesheet vent
Water out
Water in
Packed head
Funnel separator
Slip-on flange with split ring
Vapor vent
Baffle plate separator
Alternate head
Condensate
(a)
Vapor vent
Tubesheet vent
Water out
Water in
Packed head
Slip-on flange with split ring
Vapor
Condensate
(b)
Special water baffle
Water
Vent
Vapor
Impingement plate
Condensate
Vent
Water distributor designs
Water out
Drain hole (plugged)
(c)
Water out
Vapor
Vapor vent
Water in
Baffle rotated 90°
Condensate
Split ring head
(d)

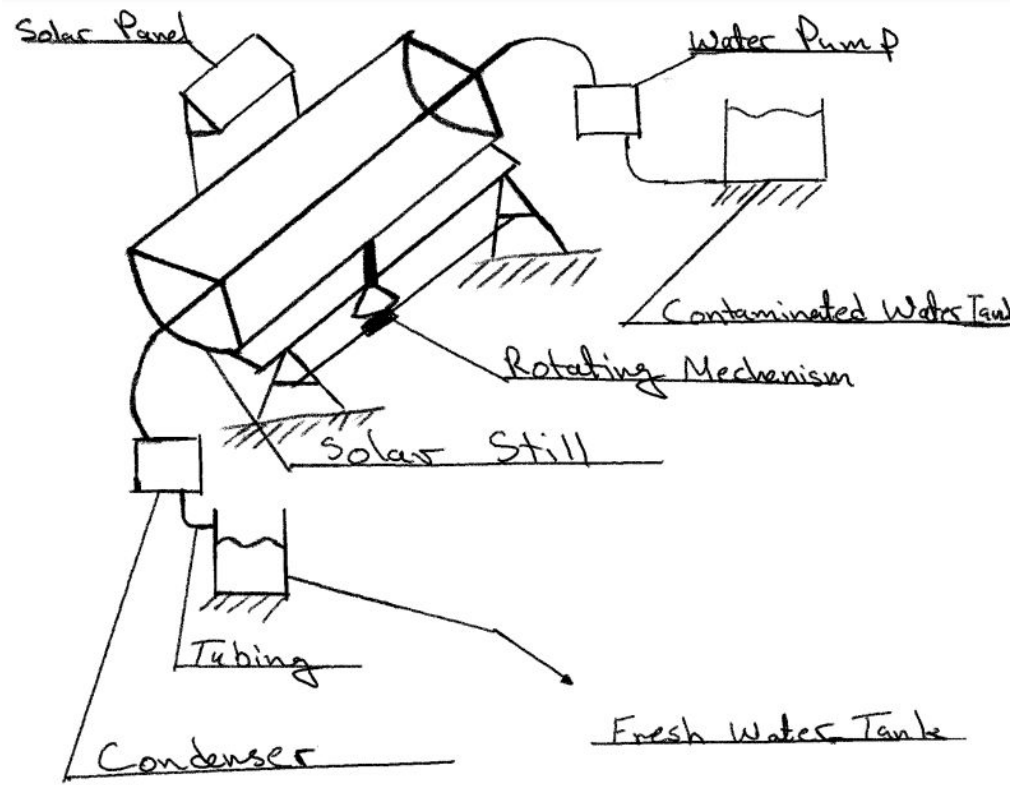
Accessibility, Portability

- Ergonomics, adjustability, and clear instructions
- An assembling machine for portability
- Temporary fasteners
- Easily assembled
- Components are appropriately sized for transportation and storage
- Multiple mirror sectionals

User Interface

- Simple controls for easy interactions
- Visual Instructions for ease of accessibility (Visual Hierarchy)
- Simplistic UI design on operating controls
- Responsiveness for interface
- Design for safety and comfort (paddings)
- Material choice for interactive parts

Brainstorm Ideas (drawings)



Design Ideas

Ideas	Weight/Size	Portability	Power Required	Cost	
Solar Power Tower	Many Different Parts over a large area and heavy	Would be extremely hard to move and would require to be set up again	Inefficient when used at a smaller scale	Expensive and requires a lot of parts	
Disk Collection	Lightweight and small	Easy to move and carry	Only focuses the Solar energy on a single point	Cheap and only requires few parts	
Parabolic Trough	Can be quite large and weight can be managed with material selection	With right design can be moved easily but would require an assembly	Focuses solar energy over a line good for heat transfer to pipes	Not too expensive and has a few parts	

:))))))))))