# CNC Coolant Evaporative Recycler

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#### **Evaporator**



## **Project Description**

Avvid Corporation is a CNC Machine shop in Laramie, Wyoming. Avvid currently disposes of large amounts of CNC coolant as hazardous waste. This coolant is a 9:1 oil-to-water mixture. Due to the large water content of the mixture, recycling costs are high. This project aims to create an evaporator that will reduce the water content of the coolant, allowing Avvid to dispose of the coolant as cheap recyclable oil. The evaporator utilizes the dry Laramie atmosphere to separate water from oil using an industrial blower and a sprayer assembly. Solar power will allow the evaporator to run sustainably off the grid.

Figure 1: Isometric View of Coolant Evaporative Recycler

#### How It Works

The evaporator works on a simple principle: evaporation. By drastically increasing the surface area of the coolant and water mixture, water is stripped from the coolant and evaporated off. The evaporator accomplishes this by forcing the mixture through a custom 21-sprayer array (Figure 2). The coolant then drops back into the tank and cycles again. As this happens, a blower constantly pushes air into the tank. The air moves over the surface of the coolant and, most importantly, through the fine coolant mist. Dry air evaporates the water, leaving the dense coolant oil to fall back to the tank. The cycle continues until the oil concentration is above 90%. See Figure 3 for a schematic of the evaporator.

## Sprayer Array



Figure 2: Exploded View of Sprayer Array



## **Design Requirements**

Requirement	Explanation	Quantify
Evaporate Water	Lower the water content in coolant to decrease the recycling costs.	10 gal/month
Fluid Capacity	Minimum capacity of 155 gal.	155 gal
Drain Oil	Be able to drain the oil into 55 gal barrels once processed to <10% water.	1 gal/month
Off the Grid	No external power/water/gas sources. Solar power can be used.	
Test Oil	Be able to test the quality of the coolant being processed.	≤10% water
Ease of Use	Loading and unloading must be safe and easy to complete by all individuals.	3 Way Valves
Compliance with Environmental Safety	The oil can not leak into the environment.	

Figure3: Schematic of Evaporator System

This table addresses requirements set forth by Avvid Corporation. These are the driving standards for the design.