

The Adventures of N4429L

1982 Cessna T-210N Turbo Centurion



Here is the Engine Dehydrator I built for N4429L's engine. I looked at the several products on the market as well as the do-it-yourself plans that are available. They looked good, but in the end I decided to make one myself.

This is a simple design, without the closed loop controls and automatic regeneration found in some. Ambient air is pumped up through a column of silica gel desiccant, through a filter, and into the crankcase. The purged air exits through the crankcase vent tube. I made some rough performance calculations which show that the dewpoint of the dry air is around -40 deg F. That's as dry as any desert on earth which I figure is good enough.

My design philosophy was "scrounge." The plumbing parts were left over from various projects, the chair had been banished from our house, the gas filter was left over from a car we no longer own, the crock pot came from Goodwill, and so on. The aquarium pump and the desiccant were the only items I bought new and are critical to proper operation.

First, the aquarium pump. Get the smallest pump you can find, such as those that are labeled for 5 gallon aquariums. A larger pump is WORSE, not better!

Second, purchase good quality indicating silica gel from a chemical supply house. Here is one source: <http://www.sorbentsystems.com/bulksorbents.html> Part number 63940AG05 will work fine. Don't use silica gel cat litter, as your results will be unpredictable.

I'd note a few factors to be careful of. First, make sure there is no way the engine breather can become plugged up, such that the pump could pressurize the crankcase. I don't know what harm this might cause and I don't want to find out. Second, add "Remove Before Flight" streamers, and update your checklist, so you don't forget something before starting up. (See the note below about leaving the dipstick out.) Third, I'm not comfortable leaving the hot crock pot running unattended in the hangar, so I take the saturated desiccant home to regenerate it.

Questions and suggestions are welcome.
Regards, Maurice.



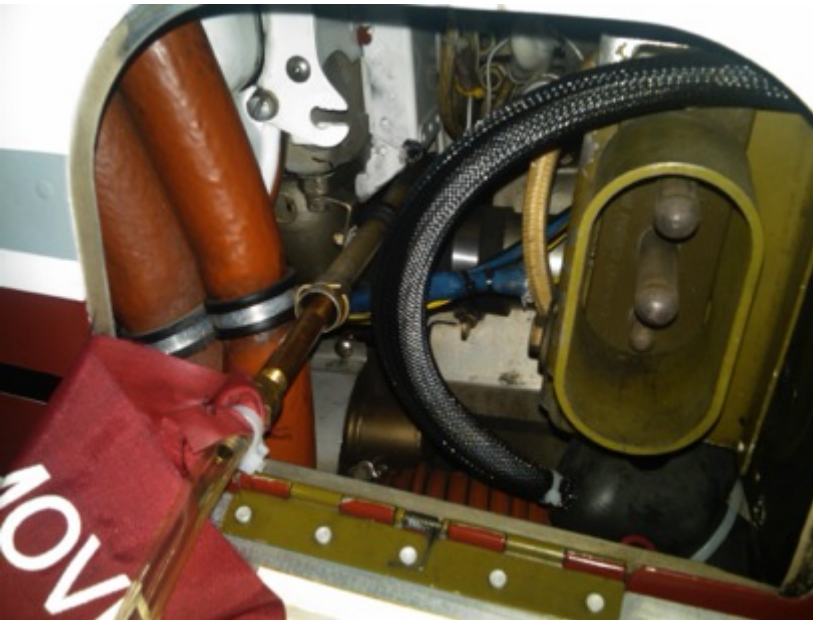
The dehydrator system connected to N4429L's engine, quietly doing its job. Dry air flows into the engine through the dipstick tube and exits mostly via the breather tube. Note the in-line gasoline filter in the line just before the dry air enters the engine. This prevents any dust or other particulate matter from entering the engine.



The structural supports (chair and bungee cord), the reactor column (4-in PVC pipe with rubber plumbing caps), the compressor (small aquarium pump), and digital controller (lamp timer).



The air inlet fitting's outside diameter and o-ring groove dimensions are same as dip stick plug. It's easy to insert and remove with the engine hot, without getting oil on your clothes.



The air inlet fitting inserted into the dipstick tube. Don't forget to put the dipstick back before flying. It's amazing what a mess a half quart of atomized Aeroshell can make. Please don't ask.



Removing the top rubber cap shows the inside of the desiccant column. The column is about half full of silica gel. Air enters at the bottom and flows upwards through the desiccant, so the desiccant at the bottom becomes saturated first. The blue color at the top indicates the desiccant still has capacity to absorb moisture.

The small tan bulb is a humidity sensor I removed from another piece of equipment. This is not required, I just used it for experimentation.



The timer ON and OFF trippers are 6 hours apart. To start the cycle, connect the hose to the hot engine, and rotate the timer wheel clockwise until the OFF tripper just turns the switch OFF. The time-of-day scale doesn't matter. Then...



...turn the manual switch ON. The pump will now run for 24 hours, then 18 hours OFF, then 6 hours ON, repeating forever, or until you next stop it to go flying.



This oil has about 35 hours on it. It's difficult to see in this photo that the oil color is greenish-brown. Before using the dehydrator, the oil typically turned black by about 10 hours. Clearly the purging of moisture is having an effect.



The desiccant reactivation reactor. On high setting the crock pot slowly heats up to about 220 deg F, which is ideal for regeneration. Higher temperature won't hurt the desiccant itself, but will ruin the blue-pink dye indicator. Also, rapid temperature changes can cause the desiccant to fracture and turn into dust. This doesn't happen in the crock pot as the heating is gradual, but be careful if you decide to use an oven or other method for regeneration.



Saturated desiccant ready for regeneration, showing the mostly pink dye indicator with some flecks of light blue still showing. A charge of desiccant has been lasting about a month before regeneration is needed.



The desiccant after about one hour of regeneration. Note the condensation inside the lid showing that moisture is being driven off. The dye indicator is starting to turn blue around the edge where the heating element is.



All the pink pellets have turned blue, indicating regeneration is complete. Normally I let it run overnight, although about 8 hours will do. Seal the regenerated desiccant in a Ziploc bag and it's ready to use again.



DON'T USE THIS! I originally thought silica gel cat litter would be an economical way to buy silica gel. However experiments by myself and others have shown highly variable results with cat litter. I believe it is because the particle size is too large on average, and also quite variable. Don't waste your time with silica gel cat litter! If you did buy cat litter on my earlier recommendation, I'm sorry for leading you in a wrong direction. Just get yourself a cat and use it up.

© 2012 - 2015 Shingebiss LLC [Contact Me](#)