Power Plant Insurance

Make your own engine dehumidifier

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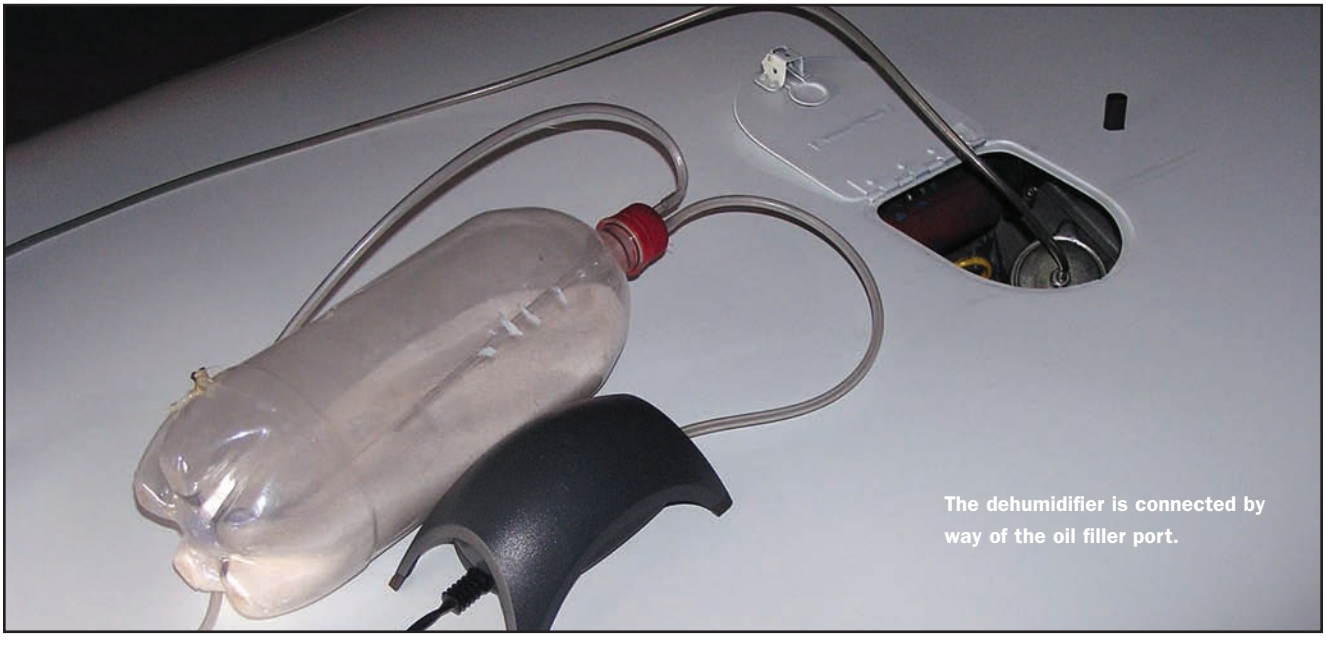
Continental and Lycoming typically rate their engine life from 1,600 to 2,000 hours of operation between overhauls on most models. However, the only owners likely to achieve that kind of rated performance are those who use their aircraft on a nearly daily basis. Why? The reason is not the flying. It is the parking!

A primary culprit for premature aircraft engine overhaul is corrosion caused by condensation within the engine cavity that occurs after shutdown. Aircraft engines that are used daily frequently reach their rated TBO because liquid condensate is boiled off on a regular basis. Low use often results in reduced engine life. As the engine cools and the internal temperature drops below the dew point, liquid moisture condenses out of the vapor and clings to internal engine surfaces. This liquid water then resumes its ongoing process of eating up your engine from the inside out. However, *if* the dew point can be made sufficiently low, then liquid water will never form. The engine dehumidifier provides a continuous positive pressure injection of extremely dry air (dew point approximately -100°F) on a 24/7 continuous-flow basis.

How it Works

The dehumidifier is connected to the engine as soon after engine shutdown as possible—before the engine cools. It is then run on a 24/7 basis. A small aquarium type air pump



The dehumidifier is connected by way of the oil filler port.

The engine dryer system consists of a vibrating air pump, a two-liter plastic pop bottle, an airstone aquarium air bubbler as a filter, plastic tubing and silica gel pellets to remove moisture. It can be attached via the oil filter port or by way of the crankcase vents.

forces ambient humid air through a plenum bottle containing silica gel. (This is the stuff used in shipping and storing aircraft engines and electronics.) The silica gel has a great affinity for moisture and literally sucks it out of the air. The dried air is filtered and injected into the engine crankcase. Any moisture inside the engine vaporizes with the incoming dry air and is displaced overboard by the constant positive pressure from the air pump. At some point, the silica gel will absorb all the moisture it can hold. It will be obvious when this happens because it will turn blue in color.

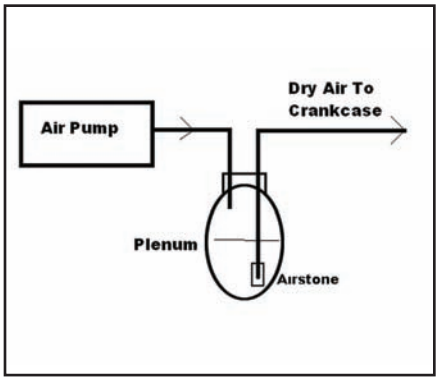
At that point:

- Remove the blue-saturated silica gel from the bottle.
- Spread it out on a cookie sheet.
- Heat in an oven at 350°F until it turns pinkish again.
- Cool and return it to the plenum bottle.

The frequency of this recycle rate will depend on the humidity of the local environment. This may vary from six months or more in dry regions down to just a few weeks in the deeply humid southeastern United States. Adding more silica gel to the plenum will extend the service interval.

Connection hookup

Connect the drier output via Tygon plastic tubing to a convenient engine crankcase access port. This is usually the crankcase blow-by vent. Alternately, a short standpipe may be added oil to the filler cap. I modified the oil filler cap by installing a hol-



low 1/4-inch-by-20 carriage bolt. (I used a lathe to cut off the threads on the leading 1/2 inch of the bolt. This permits a slip fit of the Tygon dry air supply hose.) The hollow bolt was then installed on the oil fill cap. Additionally, I made a 1/4-inch-by-20 threaded Delrin plastic plug to cap this little standpipe during flight.

Please note that if you choose to use the crankcase blow-by vent pipe as the input port, you will have to also devise a plug for the freeze-emergency blow-by slot located a few inches up the blow-by vent pipe inside the aircraft engine nacelle. If this slot is not blocked, you will be dumping the dried air out of this slot instead of into the engine crankcase.

The dehumidifier components consist of:

- A vibrating reed type aquarium air pump
- Two-liter plastic pop bottle with screw-on cap
- Airstone aquarium air bubbler
- 8 feet of 1/8-inch bore Tygon plastic aquarium tubing
- 12 inches of 3/16-inch o.d. (1/8-inch i.d.) rigid plastic tubing
- 1 pound of silica gel pellets

The low-cost aquarium pumps do have an irritating 60-hertz buzz caused by their vibrating reed design. So-called "silent" pumps are of the same design but are supported in a manner that will minimize noise. If you spend a lot of time in the hangar, I *strongly* recommend the "silent" type pump. To construct the dehumidifier, you'll need an X-ACTO knife, a drill and 3/16-inch drill bit and a hot glue gun.

If you are at an absolute loss in scrounging silica gel, it can be purchased from craft stores. One of our Chapter 79 members scored about 50 pounds of silica gel from our local airport engine conversion shop that installs Pratt and Whitney turbines on the Piper Malibu. The new turbine containers are packaged with silica gel.

Fabrication

Drill two 3/16-inch holes 1/4 inch off the center in the top of the bottle cap close enough to the center to allow easy tube clearance of the bottleneck interior wall. For the pump inlet input, insert a 2-inch length of the rigid tubing in one hole and hot-glue in place. Insert the remaining 10-inch rigid tube in the other hole and hot-glue it so the bottom end of the tube is positioned about 2 inches from the bottom of the bottle.

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Use a 1-inch length of the Tygon flex tube to connect the aquarium bubbler airstone to the end of the longer rigid tubing. The airstone is used as a dust filter to keep silica gel particles out of the engine. The airstone should lie on the bottom of the bottle.

Fill a clean, dry two-liter pop bottle with one pound of silica gel pellets or granules. Insert the airstone/tube assembly, work it to the bottom of the bottle, and tighten the cap. Use Tygon tubing to plumb the air pump to the short air input stub. Connect 6 feet or so of Tygon tubing to the airstone-equipped exit port and to the crankcase breather port or any other convenient access to the engine crankcase. All connections and seals must be a leak-tight fit. Mating via the crankcase blow-by vent tube (usually located near the firewall) may be done by inserting a piece of the rigid tubing through a 3/4-inch closed-cell-foam ball or a tight-fitting rubber stopper. (If you go that route, you will also have to make a removable plug for the freeze slot.)

A kit of engine dryer parts is available at *www.geocities.com/powertugs*.

Dave Barker helps produce the EAA Chapter 79 craft and techniques page.