IF you own an engine, then you need this!
Cheap insurance, you can build to help get you engine to its rated TBO
EAA Chapter 79 Spokane, WA ---Dave Barker Revised Oct. 2007

Continental and Lycoming typically rate their engine life from 1600 to 2000 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 rate 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^{o}F) on a 24/7 continuous flow basis. It is recovered at the crankcase blow-by vent, returned to the pump, dried again and re-injected in the oil fill port of the engine.

How it works
The dehumidifier is connected 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 forces ambient humid air thru 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 moved by the constant positive pressure from the air pump to the crankcase blow-by vent, back to the pump and the Silica Gel dryer. At some point in time, the Silica Gel will absorb all the moisture it can hold. This is oblivious because about 5% of Silica Gel crystals are dyed blue with Cobalt Chloride that changes to a Maroon Pinkish color when saturated with moisture.
When that happens:
Remove the saturated Silica Gel from the bottle.
Spread it out on a cookie sheet.
Heat in oven at 275^{o} F until the CoCl dyed silica gel turns blue again. .
Cool and return to the plenum bottle.
That's' it.
The frequency of this recycle rate will depend up the humidity of the local environment. This may vary from months or more in dry regions down to just a week or so in the deep humid South East. Adding more Silica Gel to the Plenum will extend the service interval. Additional Silica Gel used for drying flowers is available at the national chain of Michaels's Craft Stores

Connection hookup

Connect the drier output via Tygon plastic tubing to a convenient Engine oil input cap. A return line of Tygon tubing is fitted to the crankcase blow-by port. The preferred means of connection is a ¼" hole drilled in the oil filler cap and the installation of a short standpipe to the oil filler cap. I modified the oil filler cap by installing a hollow a ¼"-20 carriage bolt. (I used a lathe to cut off the threads on the leading ½" 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 ¼"-20 threaded Delrin plastic plug to cap this little standpipe during flight. Also, you will need to make an adapter to fit the crankcase blow-by tube. This can be a rubber stopper drilled to fit the Tygon return hose or a piece of rubber tubing with the return Tygon tube hot glued into it.

Please NOTE, You will have to also devise a plug for the freeze-emergency blow-by vent located few inches up the blow-by vent pipe inside the aircraft engine nacelle. This can be a rubber flapper the normally closes the freeze vent. If the blow-by tube is frozen shut, crankcase pressure will push the rubber flap open.

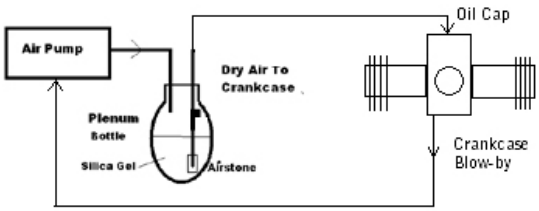
Dehumidifier Components consist of:
Vibrating reed "silent" type aquarium air pump*
2-liter plastic pop bottle with screw on cap
Airstone aquarium air bubbler
Ten feet of 1/8" bore Tygon plastic aquarium tubing,
12" of 3/16" o.d. (1/8" i.d.) rigid plastic tubing
1 lb. of 5% blue dyed Silica Gel
¼-20 custom air fitting hollow bolt
Pump air intake tube.

*Note: The low cost aquarium pumps do have an irritating 60 Hz buzzes caused by their vibrating reed design. "So-called silent" pumps are of the same design but are supported in a manner the will minimize noise. If you spend allot of time in the hangar, I strongly recommend the "silent" type pump.

Tools Required Exacto Knife, ¼" and 3/16" Drill, Hot Glue Gun &Gel Crazy glue

Original Open loop dryer

Air inlet fitting in oil filler cap



Closed Loop System Schematic

Air fitting for oil cap

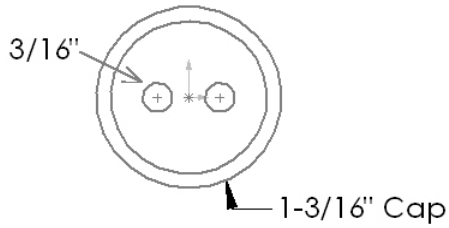
Disassembled Air pump.
Remove felt filter in the bottom of the pump and plug hole with glue.

Use RTV silicon aquarium cement around entire case seam and all four sides of the power cord strain relief.

Pump with air return adapter installed
Return air input tube adapter fitting
Drill 3/16" hole ~ ¼" deep into pump case.
Insert tube and secure airtight with glue.

Pump return line installed in Blow-by port (Mooney 231 illustrated)

Blow-by return rubber fitting



Bottle Cap
Drill Template

Extending the recycle time for the desiccant
The following modification the BARC Engine dryer kit can extend the intervals between service times for the desiccant. It revamps the dryer cycle from an open- loop system into a closed-loop. Dry air is still injected as before into the oil filler neck, but an addition, a vacuum line is attached to the crankcase blow-by tube and returned Dryer air moved back thru the engine. This eliminates the continuous drying of external incoming humid air into the system. This closed loop provides for continuous circulation of ever-dryer air in the crankcase.

Implementation

The air pump must be converted to a blow & suck configuration. To do this you will need to make an additional fitting for an the air intake port next to the air output port on the pump. Drill a 3/16" hole ~1/2' to the right of the exhaust port. (As view from the bottom) (See photo) Remove the felt filter in the belly of the pump case and plug the hole with glue. Additionally, to work as a vacuum pump the pump case must be made airtight. This is done by dissembling the air pump case (2 screws) and applying RTV silicon aquarium cement around the entire case seam and around all four sides of the power cord strain relief. The case is reassembled and allowed to dry.
Also add RTV glue to screw heads or tape over recess holes in the case bottom for airtight seal.

You will also need to make and adapter fitting such as a rubber hose or rubber stopper fitted with a length of the Tygon Tubing to serve as an air return to the pump.

Desiccant and pump with return airline.

Fabrication

Drill 2 ea. 3/16" ~ 1/4" off the center in the top of the bottle cap close enough to center to allow easy tube clearance of the bottle neck interior wall. For the pump inlet input, insert a 2" length of the rigid tubing in one hole and hot glue in place. Insert the remaining 10" rigid tube in the other hole and hot glue it so the bottom end of the tube is positioned about 2" from the bottom of the bottle. Use a 1" 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. To prep the Desiccant Silica Gel Place it in you kitchen oven at 275^{o}F until the dyed Silica Gel pellets turn blue (They are Pinkish when saturated with moisture). Open the bag and pour contents it into a clean dry 2-liter pop bottle. Insert Airstone/tube assembly, and work the Airstone to the bottom of the Silica Gel and tighten the cap. Do not delay, as it will absorb moisture from the air. Use ~ 1 foot of the Tygon tubing to plumb the air pump to the short air input stub. Connect 6 feet or more of Tygon tubing to the Airstone equipped exit port to the air fitting on the oil filler cap. Connect the pump return line to the crankcase breather port via an airtight rubber seal. .

Note: **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" closed-cell-foam ball or a tight fitting rubber stopper.

A secondary modification required is a plug for the freeze slot in the blow by tube. This can be a rubber flap around the blow-by pipe that is normally closed over the freeze slot, but is pushed open by crankcase pressure if the exit end of blow-by tube end should freeze shut. Finally, a foam plug fitted to you aircraft air intake with a "REMOVE BEFORE FLIGHT" flag attached will close up the system circulation (in the case of a crankshaft position that leaves an intake valve open.

Parts List

Item	Cost	Source
Silent Aquarium Air Pump	$16.95	Wal Mart
2 liter clear plastic pop bottle with screw on cap.	~$1.00	any grocery
10' Tygon aquarium tubing	$ 2.85	Tropical fish store
12" rigid 3/16"plastic tubing	$ 1.95	Tropical fish store* *(You may have to go to several stores to find this rigid tubing)
Aquarium bubbler Air Stone	$ 0.95	Tropical fish store
¼-20 x 1" air fitting hardware	$ 10.00*	*est. machine shop time
¼-20 Delrin cap		
Air return adapter fitting		
¾" closed-cell foam ball	$ 0.50	Toy's R Us
Silica Gel Pellets w/CoCl	$ 9.95/lb*	*Michaels Crafts Stores

*If you are at an absolute loss in scrounging Silica Gel, it can be purchased at Michaels Crafts Stores chain.

Price is $25 + shipping cost Ship weight ~ 3 lbs

Additionally, You will need a clear 2-liter bottle of soda pop. (Not included in kit)

NOTE: The desiccant may have acquired moisture during shipping or storage is sure to heat at 275 degrees until the dyed silica gel turns blue again. Use your kitchen oven. Let it cool in the oven or a sealed container and then transfer while warm to the plenum bottle.