The Late G80CS, Norton Oil Pumps and Wet Sumping (Caveat Emptor)

By Paul Allen

One of the last steps in completing my 1964 Matchless G80CS/Rickman Metisse Mk 3 is to assemble the engine timing chest, containing the later Norton-style oil pump and cams. My restored 1967 G80CS wet sumps rather badly, so for the Rickman I vowed to minimize this from the start. After I have finished the Rickman, I'll dive back into the G80CS to find out what went wrong.

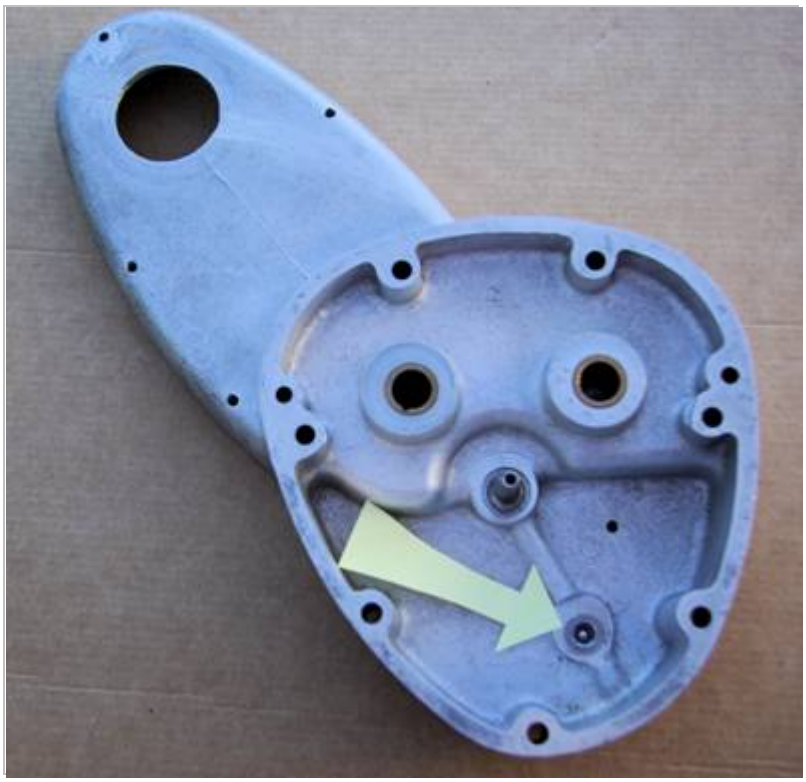
I have collected a small set of Norton-style oil pumps, ranging from NOS to well used (photo 1). Two of these are genuine G80CS pumps, two complete pumps and one partial are for Commandos, and one is an earlier Atlas pump. On eBay, each was described as a "G80CS Norton-style" pump, hence the "caveat emptor" above.

Dave Campbell of Alaska, esteemed prior editor of the North American Section AJS/MOC Matchless News, explained in a September, 2000 article that Norton oil pumps come in various models. A correct G80CS pump has feed pump gears that are 3/16" wide, while a Commando pump has 1/4" wide feed gears. This provides 1/3 more oil flow for the later Norton twins. In the case of each pump, the return pump gears are about 60% wider than their feed gears, for excess return capacity.

A correct Norton-style G80CS pump, as used from 1964 on, provides a good flow of oil to the engine. When a Commando pump is used on a G80CS instead, however, the higher flow doesn't seem to be a disadvantage, and is preferred by some for racing.

In later years, Commando pump output was increased even more by changing the tooth angle of the worm drive, and thus increasing the pump rpm. Early and late drive worms and gears cannot be mixed without disastrous results. Photo 2 shows an early and a late Commando pump, with G80CS drive worms in place for reference. The correct crankshaft drive worm axis should be 90 degrees to the pump shaft axis, as on the left. If your fit is oblique, as on the right, you must either find another pump or install an earlier drive gear.

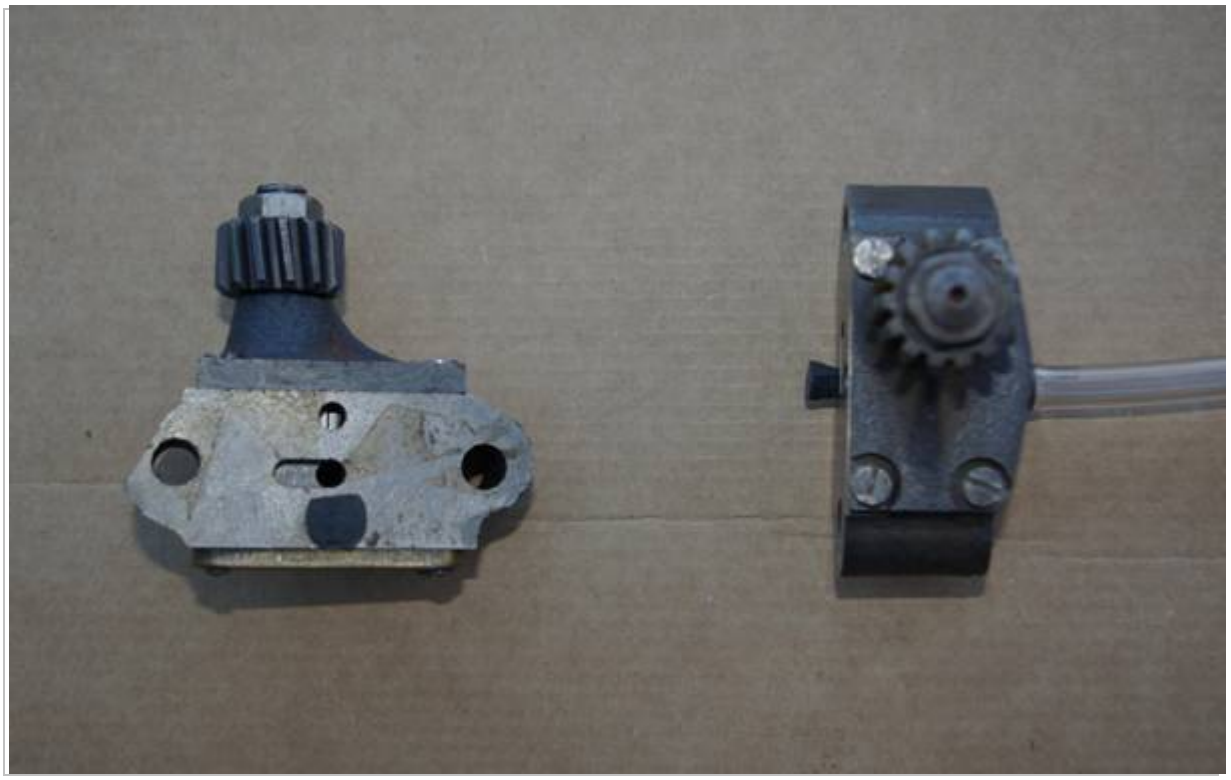
A 650cc Atlas oil pump, shown in the lower right corner of photo 1, has the same 3/16” feed gears as a G80CS pump. It is almost identical, but lacks a clearance bevel on one end of the pump body. The clearance bevel isn't actually needed for fit on a G80CS, so an early Atlas pump can be used without modification. In engines with Norton oil pumps, wet sumping when the engine is off can result from leakage past the feed gears, into the engine oil feed galleries and ultimately down into the crankcase. As shown in photo 3, a 1964 or later G80CS timing chest contains a ball check valve, with light spring pressure, which tries to shut off this gravity feed flow path when the engine is off. To assure the check valve works well, it should be carefully pried out of the timing chest, and the ball should be re-seated with a brass hammer or drift before reassembling the timing chest and installing it on the crankcases.



Wet sumping also comes when oil leaks from the lower feed gear cavity of the pump, up the gear shafts into the return pump gear set, and then down into the crankcase through the return pickup. One remedy for this leakage, if you need to address it, is to carefully machine grooves in the pump drive shaft and install o-rings. These o-rings then need to be replaced periodically. My dilemma was- which of my oil pumps to select for the Metisse, to minimize wet sumping? To find an

answer, I cobbled together a crude test rack which includes an oil delivery reservoir graduated in cc's, mounted to provide a 15” standing head of oil above a test pump. A drip pan underneath collects anything that leaks from the pump (photo 4).

Assuming the timing case check valve does its job of stopping leakage through the feed pump gears, that leak path can be ignored for the moment. With that in mind, I cut small pliable rubber stoppers, and plugged the inlet opening of the lower feed path on each test pump. For the Commando pumps, the rubber stopper needs to be oblong to plug its feed opening. This same oblong feed inlet is an easy indicator that a Norton pump is for a twin- a G80CS feed inlet is round.
On the opposite side of the pump, I slipped a plastic feed line from the reservoir snugly over the pump's short feed outlet stub, as shown in photo 5. During testing, I used 20/50 wt oil to get a somewhat faster leak rate. As a traditionalist, though, I run straight 50 wt in regular operation of my G80CS engines. After taking outside photographs, I brought everything indoors, where temperatures were more stable during several weeks of testing. I tested each pump for 24 hours. After 12 hours, I rotated each pump drive shaft about 180 degrees to get a second random fit of shafts and gears inside the pump.



Overall, given the bigger wet sumping problems I have with my first G80CS, I was surprised by the low rate of leakage from each of my pumps, noted in the table below. Even at the worst rate of 9.5cc in 24 hours, it would take 100 days for a

quart of 20/50 wt to leak into the sump. On some pumps, I found that almost all of the leakage seemed to come from between the pump body and its bottom brass plate. In other pumps, including the NOS Commando pump, much of the leakage seemed to come by the feed gear to return gear path.

For a second series of tests on the pumps, I carefully dressed the base of each pump body and its mating bottom plate, using 400 grit wet-or-dry sandpaper on a flat plate, for a tighter fit. Because it was new, I opted not to dress the bottom of the NOS Commando pump or retest it, although its leakage might also be reduced by dressing. In the second set of tests, each pump leaked significantly less. Especially after dressing the pump bases, the amounts of pump leakage seem very minimal.

Then I used my test rig to measure how much oil leaks through the ball check valve in the inner timing cover, at rest. On two inner timing covers, I hooked my plastic oil feed line to the bottom banjo fitting which normally provides oil feed to the rocker box, and capped off flow that would go through the crankshaft feed quill, as shown in photo 6. During the 24-hour test, I pushed the ball off its seat several times, to try different ball/seat variations.

I tested the check valve in timing cover #1, without removing the valve or reseating the ball. It began to weep oil rather quickly, and in the course of 24 hours, leaked 29.8 cc's. While that much oil might not bleed through the feed gears in a pump, the check valve was providing no restraint to wet sump flow. Perhaps I will find that this is my problem with the '67 G80CS.

I had previously reseated the ball in the check valve of timing cover #2, and it did much better on its first test, leaking only 2.1 cc in 24 hours. I decided I would try to dress the fit of both check balls in their seats, to improve their fit more, particularly for timing cover #1. Taking the ball and seat out again, I first used valve grinding paste, and hand-rubbed the check ball in its seat. After washing the parts, I then replaced each 7/32" ball bearing with a new one. Along with brass drift seating of the ball for cover #1, this made a big improvement in its wet sump leakage. But for cover #2, it made flow worse, at 5.1 cc/24 hrs. To try to improve cover #2, I then lapped the ball and seat with polishing compound, on the theory that valve grinding compound was too coarse. When I got close to my earlier result on cover #2, I decided to leave well enough alone and stopped.

The final ball check leak rates are minimal. The total amount of wet sump leakage will be the sum of what comes from the pump itself (with feed path plugged) and what passes through the seated ball check valve.

Pump description	Oil leakage (cc/24 hrs)	
	As-is leakage	After dressing
Used G80CS pump #1	9.5	0.0
NOS Commando pump	6.7	NA
Used G80CS pump #2	4.7	0.0
Well used Atlas pump	7.1	1.9
Used "higher rpm" Commando pump	5.5	1.9
Inner timing cover ball check valve #1	29.8	2.8
Inner timing cover ball check valve #2	2.1	2.5

Now that I have a better understanding of the issues, I look forward to exploring the possible sources of wet sump leakage in my '67 G80CS, and testing its pump and check valve.