COMET WINDMILLS AUSTRALIA PTY LTD
VERSION 11

MAINTENANCE HINTS FOR 'C' PATTERN COMET® 8FT -14FT WINDMILLS

Comet® Windmills are designed to pump the maximum amount of water in the winds available. To ensure the optimum performance from your Comet® Mill for many years it is only necessary to give a little regular and careful attention to maintenance of the Mill Plant. Attention to the hints in the following paragraphs on maintenance and the description of procedure for testing wear in the Working Parts will make certain that your Comet® Mill continues to perform at its best.

THE MILL

Bolts: The tightness of all bolts should be checked after the plant has been in operation for two months. Subsequently, whenever the mill is being oiled, make a visual check for broken or loose bolts or pins, cracked sail brackets, bent sails, loose wheel arms, rims etc. Also be on the lookout for any broken spring lockwashers under the nuts, as they must be replaced if broken.

Oiling: The rate of oil feed through the siphon wicks depends on the temperature and viscosity (or heaviness) of the oil. The oil siphons faster with higher temperatures or lighter oils. The wool wicks filter the oil as it is siphoned, and when the wicks become clogged the siphoning rate is slower.

For maximum protection of working parts against wear by the most efficient lubrication, it is obvious that the oil viscosity should be changed to suit extreme conditions of temperature. The oil being supplied with the mill has a viscosity equal to S.A.E.60, and is suitable for warm climates with temperatures ranging from about 70-100 deg.F. (21 c – 37.7 c) If during the winter months the temperatures range from say 35-60 deg.F (1.6c – 15.5 c)., S.A.E.30 oil should be satisfactory, but we recommend that a check should be made in the rate of flow about two months after the oil change, by observing the level of the oil in oil wells and the presence of oil on the moving parts. Do not use old engine sump oil or linseed oil.

The oil levels in the main bearing, connecting rod, and turntable oil wells should be checked every three months and if necessary raised to within about ¼" of the top of the oil tubes. At the same time put some oil on the vane hinges, inner and outer collars, bottom guide for mastpipe and hardguide guide for guide bar, and also run a little extra oil all around the top end of the mastpipe so that it will not only lubricate the crosshead and crosshead pin, but will work down into the swivel. Before replenishing the oil in the auxiliary oil well it is advisable to remove the latter to see that the oil level in the main oil well is only about 1/8" below the bottom of the driving shaft. Being smaller, the oil wells in the connecting rod and turntable are likely to be emptied sooner than the auxiliary oil well. Make sure when replenishing the oil that there is no water at the bottom of the oil wells as this seriously affects the siphoning.

The thrust due to the wind pressure on the wheel is taken between the rear end of the wheel hub and the front end of the main bearing. As this point is oiled by a slight amount of oil which moves through the front bearing bush from the ring oiler tube on the shaft, see that there is wet oil around the thrust bearing.

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The ring oiler tube (part no. 101) which is on the driving shaft between the two bearings must be inspected to see that it rotates with the shaft, as it may stop if the oil becomes sludgy. Whenever the oil in any of the oil wells becomes thickened or sludgy, it should be replaced. The main oil well is drained by removing the hexagonal head drain screw at the side of the oil well, taking care not to lose the leather and steel washers. The old oil is removed from the oil wells in the connecting rod and turntable by mopping up with absorbent rag. The drained oil wells should be washed out with a little kerosene before being refilled.

The siphon wicks supplied are of the correct length and contain the correct number of strands of a definite size of wool. Do not replace the latter with any ordinary darning wool as the siphoning rate would be altered. When the wool becomes clogged, because of its filtering action, the wicks should be carefully washed in kerosene. When replacing the wicks do not alter the position of the bend in the wired portion, or if you do, be sure that the wired end of the wick is below the bottom of the oil well as far as it can go without touching the crankpin, steel balls, or ring oiler tube. If this is not done the wicks will not siphon the oil.

Wear in Working Part: When properly oiled and attended to, the working parts of the COMET® Mill should last for over twenty years. The following parts are the most likely to show the first signs of wear:-

- Crosshead Pin (Part No. 78) and Swivel (Part No. 9). These are lubricated by an occasional application of oil around the top end of the mastpipe and by surplus oil which runs down from the connecting rod bush. To check for wear, turn the wheel until the crankpin is at the top or bottom of stroke, and with a small lever under the stirrup on the mill rod, try to move the parts up and down. If the movement is more than 3/32" (the thickness of a match), and there is a knock in the mill, consideration should be given to the replacement of one or both parts. When testing, allowance should be made for any movement of the connecting rod bush or driving shaft.
- Wood Bushes in Main Bearing and Connecting Rod (Parts Nos. 191 & 192). As the specially selected hardwood becomes saturated with oil, these bearings are practically self-lubricating, and what is most remarkable, is the fact that the oil penetrates the wood, the latter swells a little. As the bushes cannot swell outwardly they become compressed somewhat and reduce the diameter of the bore, thus compensating to some extent for wear. This would not happen under two years and by then the surface on the bore in the wood becomes highly polished. COMET® Wood Bushes are definitely the best type of bearing material for a windmill. In a new mill, the wood bushes are just sufficiently slack to prevent them binding on the shaft when they have become swollen with oil. The test for wear is the same as for the Crosshead Pin and also by forcing the end of the wheel arms backwards and forwards. Should the wood bushes ever have to be replaced, simple instructions for fitting them are supplied with the duplicates.
- Ball-bearing Turntable (Part Nos. 15, 16 & 182). The ball-races are exceptionally hard alloy cast iron and the number and size of steel balls

are much greater than required for the maximum load which can be imposed upon them. If kept well oiled the balls in the ball-races show practically no signs of wear over many, many years. However, slight wear can occur if dust collects on the balls and clogs the oil hole, or if the oil supply is depleted. In the new mill there is a slight side shake in the turntable, but this should soon be eliminated when the balls rub off any slight imperfections in the ball-races.

Should the ball-races and the steel balls wear so much that the top part of the ball-bearing turntable rubs against the tower cap, the three parts should be immediately replaced, as otherwise the rubbing action makes the mill head stiff to pivot on the turntable and the mill may not govern properly, and speed up to a dangerous degree. Do not put new steel balls in worn ball-races as they would not fit groove properly.

- Bottom Guide for Mastpipe (Part No. 10). The load and consequently the wear on this part are negligible.
- Roller Guide Assembly (Part No. 11). If the play here is excessive the pump rod or plunger may work itself unscrewed. Oil the roller spindles occasionally.

Governor: The governer spring must be carefully adjusted so that the mill will face fully into the wind, but the tension bolt should be very carefully adjusted so that the buffer stud only lightly touches the main casting when the vane is in its normal position. If the wheel does not freely move around towards the vane in the stronger or gusty winds, it is a sign that the spring is too tightly adjusted causing the buffer stud to bear too hard on the main casting. For the mill to govern properly it is necessary that the turntable should be free and sensitive. If the ball-races and steel balls are worn to the extent that the castings rub on one another, the mill will not govern properly and it may be wrecked in a severe storm, so these parts must be replaced, but that should not be necessary for well over twenty years.

Should heavy rains soften the soil around one of the foundation blocks, a strong wind may cause the tower to lean. This would throw the turntable out of level and the governing would be affected. We shall be glad to advise you on what should be done in the event of this remote possibility.

Balancing: The setting of the balance weights on wheel arms is very important. Incorrect setting seriously affects pumping capacity of mill, or its ability to start pumping in the light winds which are so much more frequent than medium and high winds.

On no account should any attempt be made to balance the water load on the upstroke. Only balance total deadweight of working parts, mill rod, pump rod and pump plunger.

Obviously the two pairs of balance weights must be on wheel arms on the opposite side of the driving shaft to the crank pin so that they are moving upwards when the crank pin and pump rods are moving downwards.

In your own interests we strongly recommend that you have the balancing of your Comet® Mill checked.

Choose a windless day.

If there is a screwed stuffing box on a siphon pump or discharge tee, be ready to loosen it right off just before balancing, even if water does leak around.

Then try moving a wheel arm when the crank pin is at top or bottom of stroke, to ascertain if the cup leather (or pump bucket) is tight. If so, it must be eased before balancing. A better method of checking cup leather tightness is to tie a rope to take the weight of mill rod or pump rod when at top of stroke, disconnect them from the mill and lower steadily on to bottom valve in pump. They should move down freely, unless of course a packing tube (or differential head) is fitted, in which case the discharge pipe from the pump or tee will have to be disconnected to release the water above it.

If cup leathers are free, connect up pump rod again and rotate wheel until the crank pin is at about the middle of the downstroke and see if it goes down or up when hand is taken off the wheel arm. Gradually move balance weights outwards or in towards the driving shaft until the wheel does not move with crank pin on middle of stroke.

Then move balance weights in and out marking the position which just allows up or down wheel arm movement to start, remembering that only the slightest upward movement of crank pin must be noticed, before the pump plunger takes the water load. Firmly clamp balance weights between the two marks in their final position.

THE TOWER:

Bolts: It is a good plan to try the spanner on the tower bolt nuts a couple of months after it has been erected, and then occasionally to make a visual inspection for any sign of loose bolts.

Painting: The threaded ends of the bolts which pass through the nuts are more likely to become rusty than any other part of the mill or tower. They should be carefully painted after the tower has been erected and then inspected about once a year to see if they require further painting. At the same time the tower steel work can be inspected for signs of rust.

THE PUMP:

Cup Leathers: Comet® Cup Leathers are made of the highest quality hydraulic leather obtainable and are soaked in neatsfoot oil. The oil should slow down the rate of penetration of the water into the leather, and as the water causes the leather to swell, Comet® Cup Leathers are less likely to swell and become tight in the pump barrel than others. However, they may swell and in doing so they may become so tight in the pump barrel as to put a heavy load on the mill, thereby preventing it from

working in light winds. A tight cup leather can also cause a knock by jerking the working parts upwards at the beginning of each downstroke.

It is a good plan to tie a light rope around the stirrup, disconnect the mill rod, and by handling the rope, see if you can detect any stiffness in the downward movement of the pump plunger. If the mill does not start in light winds it is, as mentioned above, another sign of tight cup leathers.

The remedy is to remove the pump plunger being careful to pare a little off the high spots around the heel of the cup leather – the free edges of the cup leather should never need paring.

Cup Leathers should last for years, depending upon the chemicals in the water. When they are worn to the extent that they do not hold water efficiently, they should be replaced. When fitting a new cup leather be careful that the centre hole is dead concentric with the outside of the leather and that the hole is only just big enough to allow the leather to be twisted down on to the plunger body. When tightening the plunger body by means of a flat steel bar or flat file in the slots in the end, and a Stillson wrench on the boss of the plunger cage, be careful not to tighten it so much as to cause the heel of the leather to be squeezed outwards. However, it should be firmly tightened and then tried in the barrel. When new, the diameter of the heel of the 3-1/4" cup leather should be a full 1/16" smaller than the inside diameter of the pump barrel. The diameter of the top edges must be the same as the pump barrel.

Valves: The bronze mushroom valves and their seats should last a very long time, but they may wear fairly quickly if there is any fine sand in suspension in the water. When the valves leak the pumping rate is reduced, and if the mill is idle for a long time the water could leak down through the plunger and bottom valve.

To ascertain if the cup leather and pump valves are leaking, a test should be made of the pumping capacity of the pump. With the 3-1/2" stroke of the 10ft mill and the 3-1/4" pump, eleven strokes would be required to fill a one gallon tin held under the end of the discharge tee at the tank. This number of strokes allows for the normal and inevitable slippage of 10% of the water past the valves. If the slippage or leakage is greater, obviously more pumping strokes will be required to fill the gallon tin.

If the valves are not badly worn they may be lapped flat on their seats with the use of valve grinding paste, care being taken to remove all traces of the paste after lapping. If the valve seat has been damaged by some hard particle such as a small pebble, it would be better to have it refaced in a lathe, or replaced.

If the edges of the mushroom valves become burred, it is a sign that the valve has not been seating squarely. This burr may catch on the inside of a prong of the cage of the plunger or bottom valve, and so prevent the valve from seating. The remedy of course, is to remove the burr to ensure that the valve cannot become stuck up.

Brass Barrel: The barrels should last a very long time, but they may become worn if gritty substances are present in the water. When they are worn even new cup leathers would not be able to hold the water.

Plunger Rod: Whenever the pump has to be attended to for some reason or another, it is a good plan to check on the tightness of the plunger rod in the pump plunger and screwed socket connections.

Strainer: Decayed frogs, rabbits, vegetation, etc, in the water in the well may frequently block the holes in the strainer. The first evidence of this is a reduction in pumping capacity and a knock in the windmill working parts. The remedy is obvious.

Pipe Clamp and 'U' Clip: As these two parts are bolted to hardwood supports which may in time shrink, it is advisable to check the tightness of the nuts occasionally. This also applies to the bolts holding down the hardwood down the hardwood bearers across the top of the well.

GENERAL:

If the performance of the mill is not entirely to your satisfaction please do not hesitate to communicate with us. Our keen interest in the satisfactory operation of all Comet® Mills is maintained throughout their whole life.