County's uncomplicated clutch

Simon Bowes on social media, keyboard warriors and, more importantly, the County's PTO clutch.

I FIND that social media makes for a lack of restraint and good manners. People seem awfully brave in the opinions they offer up as gospel, and they refuse to acknowledge even the slightest possibility that they might be wrong. There's a great quote that goes, "Better to remain silent and be thought a fool than to speak and remove all doubt." It is a good rule to follow, especially if, like me just now, you have a keyboard at your fingertips and a whole world of critics just a couple of clicks away.

Minor arguments that descend into slanging matches featuring foul language and physical threats are almost the norm if you know where to look. I followed a thread about motorbike alternators one night, where a UK biker was asking why his Kawasaki GPX 750R Ninja wasn't charging. A helpful poster asked if he'd checked the alternator drive belt and went on to explain the tools needed to remove an old belt and fit and tension a new one. A guy in Australia quickly posted that the model in question didn't have a belt driven alternator. I had just tensioned the one on my example of that fine 80s motorcycle so I knew the Oz guy was talking out of his hat. The row went on for some time before the first guy who'd been trying to help posted a picture of the page in the genuine Kawasaki manual that showed the belt and how to tension it. The Australian suddenly realised he had lost the argument and obviously switched off his computer. He had been extremely insulting to several people in the previous half hour though and I noticed that anything he posted after that was scrutinised by many and ridiculed by some. It took several months before anything he posted was allowed to go unchallenged. If only he'd stopped and used a moment to search the web with a few key words he would have discovered he was making himself look a fool in front of the entire world, potentially.

My wife calls them 'keyboard warriors', I call them idiots; they're the same guys you'd have found years ago spouting rubbish in the pub until someone threatened to introduce a fist into the argument to shut them up.

The problem now is that all the argumentative BS merchants in the world have a direct line into our lives via the internet, if we give them the opportunity. It's my firm belief that Facebook is very much like alcohol – it's fine as long you use it, but once it's using you...

I use Facebook sparingly. Once it starts to wind me up I log out and go do something else, like bolting something together in my shed. There's no radio, television or phone and most definitely no computer, laptop, tablet or otherwise. The Facebook comment I saw that started this train of thought was the oh so confident statement from one individual that the PTO clutches on County tractors were not up to driving winches – they slip and, ultimately, are rubbish. I thought about replying to him, but there's little point debating with someone who's so confident that he can tell the whole world that a type of tractor that's pulled millions of tonnes of timber over the last forty-odd years has a useless PTO clutch. He doesn't deserve anyone investing the time required to argue with him; and no one did.

THE HYDRAULIC OIL FILTER IS THE ONE THING THAT IS OFTEN OVERLOOKED

The PTO clutch in a County tractor is a proven design that's been used with great success to drive everything from power harrows to slurry tankers in a range of Ford tractors, large and small. It's not a complicated thing compared to some components in forestry machines.

It's basically a big motorbike clutch that takes its input direct from the tractor's flywheel via a shaft that rotates all the time the engine is running and puts it to the PTO via another shaft that rotates once the clutch engages. The clutches in cars, tractors, motorbikes etc are engaged as a default with the provision for disengagement being via a cable or hydraulics, by pedal or lever. The PTO clutch in a tractor is disengaged as a default position with a slightly more complex operating system to make it engage; it also has a brake that stops it turning once it is disengaged, as a safety feature to reduce the number of accidents from the entanglement of the unwary.

Ford tractors, upon which most County tractors are based, have a lever on the side of the rear axle casing that operates a spool valve mounted inside the case. The spool supplies oil from a small pump, integral to, but essentially separate from, the main hydraulic pump. This oil flows through a steel pipe into the piston carrier which is a loop of metal that creates a cylinder for the piston built into the output side of the PTO clutch pack. The piston has three piston rings that form a seal inside the carrier. When oil is forced into the carrier it pushes the piston forward and the clutch plates move together engaging the clutch, locking the two shafts together and driving whatever is connected to the PTO shaft. In a clever little twist, it also releases a brake band that is fitted around the outer case of the clutch pack. Once the lever is returned to the off position, this brake band is pulled tight around the clutch pack and the whole thing stops turning. If it doesn't, and the HSE inspector sees it you'll get a prohibition notice which will mean you can't use it until it's fixed.

Going back to 'Mr Sure Of Himself' from Facebook, there are several reasons why a PTO clutch doesn't work, but fundamentally it is because the clutch plates (driven and driving) aren't gripping together.

The simplest answer is that they aren't being pushed together hard enough. The first thing to check is the pressure from the pump.

One thing often overlooked on these tractors is the hydraulic oil filter. This is in a fairly exposed position where it can get knocked by sticks and can be stood on by a driver twisting around in the seat to operate a manual winch. The inherent weakness of this idea is that the

PTO clutch pictured far left.

Left: PTO piston carrier

COUNTY'S UNCOMPLICATED CLUTCH

hydraulic filter works on the suction side of the system so if it isn't sealing properly, the pump draws air instead of oil and the hydraulics won't work. The first step is to check and maybe replace the filter. I have seen tractors, with no hydraulics working at all, be fully functioning within minutes after having a bent and buckled filter replaced with a shiny new one for less than £20.

The only thing the main pump supplies oil for on most skidders is the blade, though it will also be providing the oil for a hydraulic winch if you have one fitted like I do on mine, which has its own relief valve and gauge so you can crank the pressure up and see what you're getting. It won't tell you what the little pump is giving though, so back to the drawing board. There is a port for a pressure gauge on the side of the pump and the low-pressure pump should deliver 160–180 psi. If it isn't, it's shot but they are usually OK as just stirring the oil around should generate that sort of pressure.

If you need to change the small pump then it's a complete hydraulic pump at around £250. The low-pressure pump can't be bought separately. To remove it, drain the oil, drop the brake pedals off and undo the ring of bolts around the pump and pull it out a little until you can unbolt the low-pressure pipe, then remove it all the way. The stub of pipe that comes off with the pump will need swapping onto the new pump and all new O rings must be used. To refit, push the new pump part way in, bolt up the low-pressure pipe and slide it the rest of the way before tightening the securing bolts. The pick-up pipe stub will locate into the pipe to the strainer; as it is immersed in oil all the time it doesn't need to be a spectacular seal.

The next bit to check is the operation of the spool. To do this you need to remove the hydraulic top from the axle housing. The first time we did one of these, some twenty or more years ago, it caused an awful lot of head scratching because once the seat is out and all the bolts and nuts are removed from the perimeter of the casting, the thing won't come off. Just in front of the hydraulic filter there is a large bolt head which, when unscrewed, reveals a long tube that passes through the casting. The hydraulic top won't come off until this has been removed.

Once you have it removed the operating lever, spool and clutch pack are easily accessible... well not easily maybe, but you can see what is going on. If the PTO has previously been freewheeling, even when switched off, you will be able to see why. Usually the brake band that wraps around the outside of the clutch will be broken or it will be flopping about hanging off the edge of the drum. Don't bother going to the trouble of setting it up properly and adjusting the tension. It'll just fail again after a couple of days, or maybe after a couple of times of being switched on and off, which is not a good feeling. Replace it with a new one; you'll have to do it anyway and you don't want to be pulling it all apart again within a week.

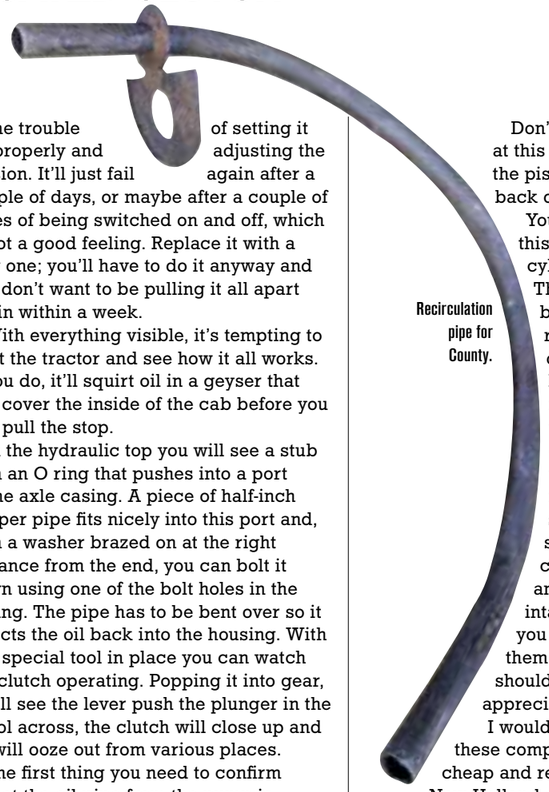
With everything visible, it's tempting to start the tractor and see how it all works. If you do, it'll squirt oil in a geyser that will cover the inside of the cab before you can pull the stop.

In the hydraulic top you will see a stub with an O ring that pushes into a port in the axle casing. A piece of half-inch copper pipe fits nicely into this port and, with a washer brazed on at the right distance from the end, you can bolt it down using one of the bolt holes in the casing. The pipe has to be bent over so it directs the oil back into the housing. With this special tool in place you can watch the clutch operating. Popping it into gear, you'll see the lever push the plunger in the spool across, the clutch will close up and oil will ooze out from various places.

The first thing you need to confirm is that the oil pipe from the pump is attached. It's a fiddly fitting to get to as it is straight up from underneath. If the pipe isn't broken, or hasn't come loose, you can move on. The operating valve is so reliable it isn't available from New Holland anymore, nor has it been for many years. If you can see oil spilling out of the clutch pack and it is physically 'tensing up', you can presume the spool's working. One telltale sign to look out for is in the carrier – the grey thing that loops around the back of the clutch pack. If there looks to be a large amount of oil spewing out of the back of it, that is often where the issue is.

It's a bit of a simplification, but if it all appears to work then the clutch pack will have to come out, although having come this far I'd always have the clutch apart for inspection anyway.

To remove the clutch, go to the back of the tractor and just above the PTO shaft there is a small plate with four bolts in it. Removing the bolts and pulling the cover out can require some effort with a small chisel or screwdriver in the joint. The cover has a bearing and a gear behind it. The gear drops the drive onto the PTO shaft gear, and the shaft it is mounted on runs forward into the PTO clutch pack. With this shaft withdrawn, there are just four allen bolts in the piston carrier holding it to the spool valve. With these removed, the clutch can be withdrawn, leaving the brake band attached to the spool.



Recirculation pipe for County.

Don't disturb the clutch at this stage, carefully pull the piston carrier off the back of the clutch pack.

You have to consider this part like the cylinder in an engine. The bore should be smooth without ridges, scratches or excessive wear. Next, look at the rings on the 'piston' that is the stub on the back of the clutch. These rings are quite substantial, they should have nice, clean, sharp edges and they should be intact and complete. If you remove them and fit them into the carrier they should have small but appreciable end gaps.

I would always replace all these components as they are cheap and readily available from New Holland dealers. The carrier, or support as they call it, is £18 + VAT, the rings are a tenner each. One point to note is that sometimes you will see, as in the pictures, that the carrier has been running out of true. The one in the picture did this after a stick came up through the cab floor and jammed under the PTO lever, breaking the cross shaft inside the axle housing where it connects to the spool. It was repaired but the damage to the other components wasn't noticed until the PTO began to stop when the oil was hot and the tractor was working on tickover.

This brings us to the difference between PTOs that stop and those that slip. When a PTO stops, usually at low engine revs, or when the oil gets hot, it is generally a fault in the oil delivery, which doesn't engage the clutch properly. A PTO that slips is usually the clutch pack itself that is at fault; the system is operating properly but the plates aren't gripping – usually down to wear.

I prefer to take the clutch pack apart and stack the plates as they come out. It is pretty easy to see what's going on with the clutch plates. First sign of trouble can be seen before you take anything apart; if the clutch basket has signs of blueing it has been extremely hot.

The plain plates should be smooth, flat, with no ridges and with no discolouration.

The friction plates should have plenty of material left on them with deep, sharply defined grooves and no signs of discolouring. The grooves in the friction

plates are important because they act to clear oil from between the plates when the clutch is engaged and to act as a reservoir for oil for lubrication and cooling. Each of the plates should be checked for true. Lay them on a flat surface individually and stack them up one on top of another. If there's the slightest sign of warping or any of them are dished they're scrap and the PTO will never work efficiently.

If there are signs of any wear or damage it is good practice to renew all the plates. They're about £40 + VAT for a set so not a big strain on the overdraft either. It doesn't make sense to go to all the trouble of pulling the tractor to bits and then not replace cheap parts.

There are a couple of other things worth looking at, including a thrust washer with locating tabs that can wear out but more often, in my experience, has one or more of the tabs broken off. This is usually as a result of it being wrongly, or badly, fitted previously. It is an important component so it's worth taking care in assembly to get everything back together correctly.

Finally, a thorough visual check that there are no cracks anywhere and no excessive wear and you can then look at reassembly. In these days of smartphones there's little excuse for not taking lots of pictures as it comes apart so it's easier to put it all back together properly. There is also a wealth of reference articles available on the internet, but I'd steer clear of social media.

With all your newly acquired bits fitted and the whole lot shiny and clean, it's pretty straightforward to get it all back into the housing. It'll cost a few cuts and grazes and provoke the usual bad language because we generally do these jobs out in the wood and the best we can hope for is level ground and dry weather.

It's prudent to check your repairs are good before the hydraulic top goes back on. You should see an improvement with good, crisp operation of the PTO and a satisfying thud when the brake band pulls tight when the PTO is switched off. If you've fitted a new brake band it's worth operating the PTO a good number of times to ensure it's set up properly and by that I mean not too loose and not too tight – too loose and it'll soon go baggy and fall off, too tight and it might snap.

The last thing to sort out are the mysterious screws with lock nuts that fit through the axle housing and locate their dowelled ends into the spool housing. These two screws are all that hold the spool valve in place, other than the piston carrier it's bolted to. If you haven't disturbed them and the wear in the piston carrier was even I'd leave them alone providing the new carrier is square on the piston. You can see if this is the case by looking carefully at where the end of the piston shows through the carrier; if it is the same all the way round leave well alone. If it obviously isn't sitting square, you can adjust it by altering the two adjusters. I was taught to undo the lock nuts on both adjusters and back them both out. The front one nearest the engine is screwed back in until it locates into the spool then screw the rearmost one in until it makes contact. If you screw the back one in further it pushes the carrier towards the far side of the axle housing and vice versa. Usually, if everything is as it should be, it will fit properly with these two screws just making contact in their respective locating holes.

Once you're satisfied with your handiwork and it's all back together it's time to test it out. Hang something big on the winch and put it to work. My 1164 has 6000 Iglands mounted with remote control and the PTO won't stop no matter what you hang on it, it'll drag the tractor back, stall the engine or snap the ropes and I rebuilt the PTO clutch some seven or eight years ago.

It's funny how many people I've come across over the years who have complained about how one thing or another isn't quite right on their skidder, forwarder, chainsaw etc... and I always find myself saying the same thing (often under my breath): "Well for %$£& sake, fix it then."

Ford PTOs are incredibly reliable. When I was at home on the farm we had Ford tractors that were bought new and used for three, four or five years before being replaced. They were serviced properly and they were well looked after. They never broke down, they commanded top trade-in prices and they were worked hard – we farmed more than 600 acres of arable land with two tractors.

I've seen skidders with oil in the back end that had maybe been new when the tractor was. I've seen hydraulic filters that were bent and buckled out of shape and I've seen someone topping the oil up with cheap supermarket 20/50.

If you want these old girls to keep pulling wood, do them a favour. Change the oil and filter now and then. Use the correct grade of oil; a good super universal is better than cheap engine oil. If you do have problems with the PTO, don't blame the tractor; it worked perfectly when it was new and it's only hard work and neglect that's causing the trouble, not some gremlin out to ruin your day.

If you do decide to tackle a problem PTO, take it one step at a time, take lots of pictures, make lots of notes and if you do turn to social media for advice... be ready to get more confused than you were at the start.