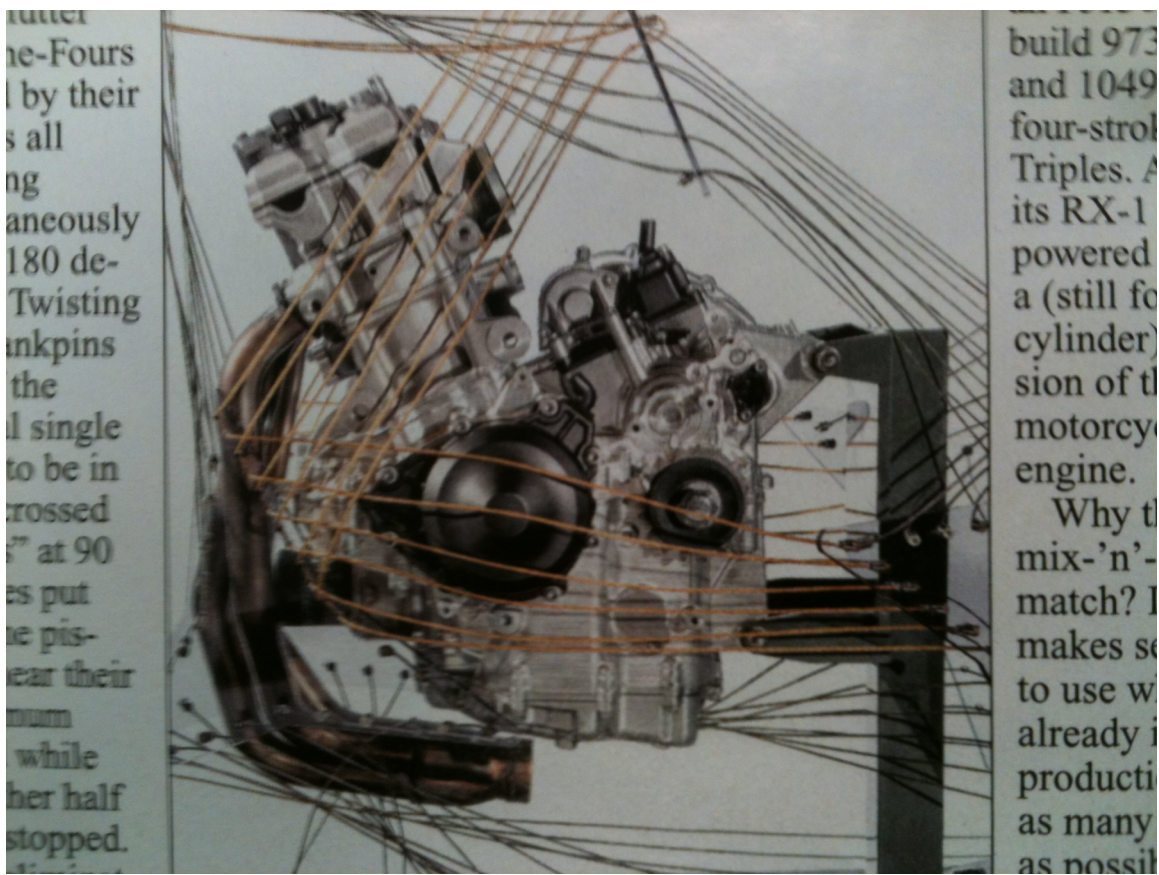




Here's a photo of a prototype three cylinder Yamaha "motorcycle" engine, taken of a page in January 2013 Cycle World Magazine, and I'm thinking that this could, or should be the engine fitted to the 2014 Yamaha Nytro snowmobile.

I subscribe to Cycle World primarily to read what Kevin Cameron has to say in each issue, as CW Chief Tech Editor. For 20-some years, Kevin Cameron has also helped us out as DTR honorary Tech Editor. KC has been a great mentor—helping us understand seemingly mysterious phenomenon regarding snowmobile engines, pipes, carbs, fuel, detonation, etc, etc, etc. In the archives on this website there are over 30 articles written for us by KC that are as valuable today as they were 20 years ago. Go back and read them again! In this CW article, Kevin talks about this engine on display at a motorcycle show, and how Yamaha has been using three cylinder engines in snowmobiles for several years. Could this be a 1049cc triple exactly like the Yamaha Nytro, but with a gear drive transmission? What for?

What caught my eye on this engine was the "stacking" of the countershaft and output shaft of this engine—resulting in the output shaft drive sprocket being situated only a few inches from the crankshaft. The Yamaha Nytro sled engine has a tapered output shaft exiting from the left side of the crankshaft. The Nytro CV belt drive clutch attaches to that output shaft, and operates at crank speed.

But here, the crankshaft instead gear drives a clutch basket that's attached to the end of a "countershaft" fitted with transmission gears 1 through 5 or 6 (it's called a countershaft because being driven by gear from the crank, and it rotates opposite of the crank rotation). Then, just below the countershaft is the output shaft that has gears 1- 5 or 6 mesh with the gears on the countershaft. So the output shaft, being gear driven by the countershaft, once again rotates in unison with the crankshaft. And on the left end of the output shaft is a toothed sprocket just a few inches behind the crankshaft.

This engine could easily be fitted to a sled chassis, and the sled's track could be driven by chain or toothed belt from the trans output shaft.

What's the big deal?

Friction, and HP lost to heat by the same belt drive system that drove my first powered vehicle—a 1960ish Montgomery Ward Silver Pigeon 5hp motor scooter that I loved, but terrified my parents. The 5hp flathead single may have put, thankfully, only 2.5hp to the back wheel and the scooter tapped out at an indicated 43mph downhill with my helmetless head tucked down, Bonneville (not Gangnam) Style.

Most of us know of people who dyno test their sleds on DynoJet snowmobile track dynos. They are great tools to optimize clutching, getting as much known engine HP as possible "to the track". D&D's tech guru Glenn Hall uses a track dyno for clutch tuning, and always sees, at the track, about ½ of the HP he gets here on our SuperFlow engine dyno at the crank taper. Could those 1960's era slipping belts be eating ½ of the HP?

Probably not that much, but there's surely a horrible price to pay for the friction created by the current CV drives. In 1986 I dyno tested a 75hp Yamaha Exciter first at the crank, then put the clutches back on and attached the dyno drive shaft to a custom track drive axle (with track removed) fitted with a dyno drive adaptor flange. We were shocked at how much power was lost—it was maybe 40hp after belt and chain drive friction turned HP into heat.

Surely, modern CV systems and belts are more efficient than our Exciter, but direct gear drives as used in cars and motorcycles are WAY more efficient. Let's pretend that the belt and chain from engine to track eat up 33% of the HP. That means that the 135hp Nytro might apply 89hp to the track. But if we deep six those 1960's belt drives in favor of efficient gear drive that may be 90% efficient, we get 122hp to the track. I just got goosebumps! We don't need no stinking superchargers! But wait—what if we add turbo or supercharger boost to that 135hp engine up to, say, 180hp with 90% efficient drive system? More goosebumps!

Surely those smart Yamaha engineers realize this. They have automatic, no lever clutches, and F1-like gear shifting capability is available—either manually or automatically. Imagine the sound of a properly muffled 10,000 RPM boosted Nytro quietly howling, auto or button shifting from one gear to the next like Fernando Alonso's F1 Ferrari. Sled manufacturers have made great strides increasing engine efficiency with

direct injection two strokes and turbocharged four strokes. But why not get rid of the power-sapping Silver Pigeon belt drives? The technology exists, and parts sit on the shelves. Let's use them!