

The Belt Pulley, the Power Take Off, (PTO) and, “Live PTO” power.

In the decades before 1920, tractors were capable of two tasks. Pulling large tillage implements and powering stationary machines. Most often, the large tillage implements were huge plows used to break tough prairie sod. Sod busting was an important task in the western US and the enormous prairies of Canada.

A typical pulling tractor of the early 1900s would weigh over 10 tons and pull a 10 to 16 bottom plow. If all was going well, at least two men were required. One to operate the tractor and one to operate the plow.

The stationary machine was most often a threshing machine or separator.

The threshing operation required a lot of work to set up. It was done infrequently. Once each day at the most. For that day, the big tractor would stand in one location with the wheels locked. A large continuous belt, was used to transfer power from the tractor to the machine. That belt system was a well-designed mechanism. The long belt transferred energy efficiently. The belt's length kept the engine, with its inherent spark and fire danger, far from the straw. The inertia of the moving belt provided an excellent fly wheel effect. The belt could be set up with one, two or no twists to provide a direction change. The belt also acted as a safety stop. If a large slug of material plugged the machine, the shock would often cause the belt to fly off the pulleys.

To standardize machine operation, most tractors were set to move the belt between 2,600 and 3,000 feet per minute. That was when the tractor was running at the optimum engine RPMs. The diameter of the tractor pulley could be changed to fine tune belt speed.

All tractors from 1900 until the late 1950s came with a belt pulley or had a belt pulley option.

*The **PTO** drive via splined shaft was invented around 1900. IH provided a PTO on the first McCormick-Deering and Farmall models and all subsequent models.*

Power was transmitted from the PTO, not by a belt but rather by a spinning steel shaft. That shaft was connected directly to a machine that was connected to the tractor's rear drawbar.

The PTO can be used much like the belt pulley for stationary work, but it has the advantage of being useful on moving machinery.

That means the tractor can power machines while pulling those machines through the fields. By 1950 all manner of farm machines had been developed for PTO operation.

The use of the belt pulley diminished, while PTO use expanded.

By 1960, all tractors had a PTO.

Tractors no longer came with a belt pulley.

In this article, “Live” power refers to PTO use.

To be “Live” means that the PTO can be controlled separately from the driving wheels and tractor motion.

There is a separate article in this book that addresses live hydraulic power.

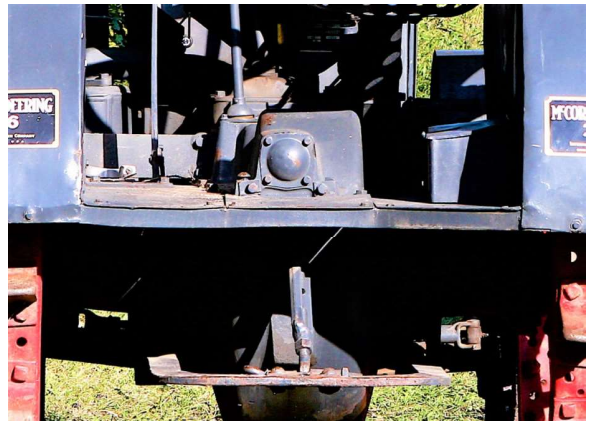
Live PTO (LPTO) allows the tractor operator to stop or change the driving motion, without stopping the PTO. That ability is very advantageous. For example, a large slug of crop material might enter the machine at once. If the operator cannot stop forward motion and allow the machine to process that slug, the machine may plug or it can be damaged.

LPTO began to appear on some tractors in the late 1940s. It was common by the late 1950s and live power became a requirement by the 1960s.

For IH tractors, LPTO became available with the Torque Amplifier, (TA), in the early and mid-1950s. The TA was a first step toward hydro-static (or automatic gear shifting).

Live power also applies to the hydraulic system of farm tractors. Hydraulic power has many uses on a farm tractor, from lifting implements to driving hydraulic motors. Live hydraulics have advantages similar to LPTO. IH introduced live hydraulics in the 1948 Super A. All subsequent “Supers”, and later models had live hydraulics.

PTO Standards: The American Society of Agricultural Engineers sets the standards for connections between tractors and implements. The Association first set standards for PTOs in 1927. Tractors designed after 1927 are standardized for PTO shape, rotational speed, height and distance from the drawbar etc. The 22-36 in the upper right photo preceded that date and has a difficult to use, non-standard PTO. The other PTOs on this page, meet the 1927 standard.



ABOVE: IH added the PTO accessory to its Standard tractors in 1921. On this 22-36 it is beneath the four-bolt cap.



ABOVE: Tractor pulleys were initially made of steel. This steel belt pulley is on a 1924 McCormick-Deering 15-30.



ABOVE: By the 1930s, when this F-20 came out, the PTO dimensions and location had been standardized by the industry.



ABOVE: Around 1940, IH switched many of their pulleys to combinations of wood, paper, leather, and canvas, for better belt-to-pulley contact.



ABOVE: The Farmall B and A came with PTO and rear-mounted steel pulley.



ABOVE: The PTO on this 1956, Farmall 450 meets the same specifications.