

Getting a Fix on the History of “Vertical Tillage”

This is an attempt to answer questions often received about how various brands have come into existence, what they really are doing to soil, and mostly try to figure out which one or ones really do the right job. This is already sounding like a formidable assignment, but it needs to be done (even if some hate mail results from it).

This is very close to the beginning of the technology roll-out in North America. The first machines to come to the US from NZ were painted red underneath the yellow paint applied in Canada and sported 6-inch tines instead of the 8-inch tines which were welded onto the 4-inch DOM tubing roller pictured here. The roller was offset forward to increase the thrust forces as the tines wore.

The helical design lacked sophistication. You can see that some of the tines are entering the soil at very close to the same time, thereby reducing the amount of effective weight per entering tine; call it tine overlap.



The larger problem with the tine arrangement on this machine lies in the fact that the sequence of the entry events is backwards. The helix should be counter-clockwise but it is clockwise instead (like a regular RH nut). This brand was built with only clockwise helical patterns from 1984 to 2000. The right-hand side of these machines required more ballast to penetrate the soil for this reason and with insufficient ballast the machines would dog-track to the right.

The direction of the roller offset was changed with new IP rights filled in 1988 and the opposite side of the machine would then need additional ballasting and the dog-tracking switched to the other side of the machine. Tines now were bolted onto clamping rings instead of being welded.

This next generation of the AerWay brand machine introduced the “Shattertine” tine design which changed three distinctive features of the tine shape or geometry. This link https://www.youtube.com/watch?v=D1HG5G_xSiM discusses the changes made to the original Bannan tine design and visually demonstrates the impact on root system development.

The Shattertine served to aggravate the penetration problem created by the incorrect helix on the left-hand side of Aerway machines. In 2000-2001 the helix was adjusted to 22.5 degrees so that clockwise and counter-clockwise helixes could be established using the same roller weldment. The problem with this when paired with 4 tines per circular group (per ring), was that the tine overlap repeated on assemblies with more than four groupings(rings) of the tines. This necessitated increasing the ballasting of the machine to get penetration, hence the addition of concrete blocks in weight trays.

I was intimately involved as an independent self-employed crop consultant in the introduction of the Aerway brand and I imported machines into the US to provide them to my consulting accounts in Northern NY and other parts of the northeast US. That relationship ended in 1987 when Aerway retained a marketing firm which serviced the region to market for them.

In 1997 while working in northern Florida, two of my consulting accounts purchased Aerway machines. This was my first observation of the new IP machines which had been built since 1988. These machines still had exclusively clockwise helixes and exhibited the previous difficulties penetrating and shook terribly. My clients were very disappointed and so we re-welded the helixes to counter-clockwise on the left side of the machines. This combined with installing the tines on the opposite side of the machine resulted in smoother operation and consistent.

The resulting impact did not fracture soil in front of the roller shaft as the original had. Instead it lifted the soil behind the centerline of the roller shaft.

Following close to 18 months of development, this Gen-Till tine design resulted and received a full patent in 2005. It was designed specifically to replace tines on Aerway machines and it returned the machines to the original Bannan tine performance characteristics when the helix was also corrected.



Requests for complete roller assemblies to be installed on assorted different frames resulted eventually in designing a complete machine which became known as the Gen-Till. It was to be built for only a short time period since the tine had then been licensed in 2002 to Precision Metal Fabricators in Canada.

The PMF machine became known as the Smart-Till and used the Gen-Till tine in a single rank rendering followed by a single rank of the Phillips Rotary Harrow which PMF had invented and was manufacturing.



About two years following the introduction of the 22 foot narrow folding machine, PMF sold the rights to HCC in Mendota, IL.

HCC introduced a considerably redesigned frame system in 2006, again using the re-created Bannan tine geometry.

These machines used a 4-tine group roller system and initially used a version of Phillips Harrow known as “triple-tooled”. It eventually became available with the choice of the original Phillips Harrow version.

HCC sold the license for Smart-Till to T.G. Schmeizer in Selma, CA in 2015. All Smart-Till units continue to use exclusively the Martindale patented Gen-Till tine.

Continued frustration with efforts to get more consistent one pass performance from the Phillips Harrows to remove weeds and create a seedbed adequate for broadcasting seed or drilling operations, eventually resulted in the tandem-roller rendering known today as CurseBuster.



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The CurseBuster provides the same fracturing ability as the original NZ tine invented by Peter Bannan, and when rendered in the tandem configuration it does a lot more of it in a single pass.

As a result of the enhanced fracturing ability, the harrows will leave root systems in the soil and prepare a seedbed of firmed soil from 1 to 2 inches deep or it can be adjusted in conjunction with the tine fracturing to run deeply enough to remove underground rhizomes up to 4 inches deep and pluck tap-rooted plants such as cotton up to 10 or more inches in the soil.

This is all achievable while leaving 99% of plant residue on the field surface.

So, in summary, there are essentially two tines in the marketplace today. The Aerway brand has created the “shattertine” and a “leaf tine” and a recreation of the Bannan tine which is installed ineffectively. All of the other tines in the marketplace are fashioned after the Bannan tine including the Gen-Till, Smart-Till and CurseBuster. Some other new tine entries for sale in the marketplace are all designed like the shattertine.

Lastly, properly designed helixes do impact tine performance and that is another subject for another day. Thanks for your kind attention. Hoping this helps, God Bless.