BEATER TYPE TOPPERS

Robert Van Horne[1]

Beater type toppers as used in the Nyssa-Nampa District of The Amalgamated Sugar Company during the harvest of 1946, were all experimental. However, definite trends as to structural patterns and regulation of ground speeds in relation to r. p. m.'s of beater shaft rotation, soon became evident enough to allow forcasting of performance before field trials. Standardization of attachment devices still awaits manufacture of well engineered and longer lasting beater paddles. When this is achieved the trends of today will become standard models, with uniform topping a realization.

Among the first beater toppers used was the four row single shaft machine, trailed behind the tractor and driven from the power takeoff, with 7 to 10 inch lengths of 2 inch belting attached directly to vertical lugs welded to the revolving shaft. Rotation to throw material backward was found to be necessary to avoid piling up of shredded material and subsequent plugging. Ground speed of this machine for best performance was 2½ M.P.H. at near 800 r.p.m.'s of the beater shaft. This ground speed is equivalent to about 3/4 throttle in low of a McCormick Deering "H" or "M" tractor.

To do a complete and satisfactory topping job with the single shaft beater it was necessary to go over each set of rows at least twice, where tops were average height -- once from each direction, to clean all sides of the crown. More trips were required where heavier foliage or bad weed conditions were encountered.

The average life of 5 ply ½ inch direct connected belting was about 10 hours due to the short area of maximum flex at the end of the attachment lug. To relieve this, various "backing" materials in shorter lengths were used to distribute the flex over a longer area. This helped somewhat, but frequent replacement still was required and brought about use of short lengths of log-chain as connecting links between shaft and paddle.

Additional use of log-chain in shorter lengths to remove the bulk of the top foliage while the belting-tipped chain paddles cleaned the crowns, reduced the needed belting by half. So most shafts were equipped with four evenly spaced rows of paddles, two opposite rows of rubber tipped chain, with only chain in shorter lengths in the other two rows. This development became more necessary as the harvest season progressed because the tops had lost most of their crisp erectness due to repeated frosts, and made more severe beating necessary for complete topping.

About the time that log-chain came into use the problem of shredding of the tops and weeds left lying between the rows came into prominence because it was being delivered by lifter-loaders. This problem produced the double-shaft beater, set up with chain and rubber to beat the entire surface of two beds and doing the complete topping job in one trip over.

[1] Agricultural Superintendent, Caldwell District, The Amalgamated Sugar Co.

This being a new type of beater, we lacked operating information. Among the first problems to show was horsepower. The first experimental two shaft machine was made to top four rows and was driven from the power takeoff of a McCormick Deering "M" tractor. This amount of power would work satisfactorily in small tops in low gear at full throttle, but in heavier tops it would choke down to the point where neither a satisfactory ground speed nor tractor motor speed could be maintained. To relieve this the drive of the rear shaft was separated from the power take off drive and powered with a separate auxiliary motor. At the same time the r.p.m.'s of both shafts were reduced to near 700. When synchronization was perfected the horsepower demand was reduced by 1/3 from the apparant demand at higher r.p.m.'s -- yet the quality of work remained equally good.

The contrast between the shredding of trash with the single shaft beater twice over as compared to the double shaft beater once over was very noticeable and attributed to the churning and chopping in the air of the material thrown backward by the front shaft into the paddles of the rear shaft, turning in the opposite direction.

Paddles for beaters were the most troublesome problem during 1946, with many varied patterns tried with varying degrees of success. It was definitely established that short paddles -- either chain or rubber -- up to 6 inches in length were not practical due to the frequency with which they had to be replaced. Paddles of excessive length such as 18 inches and over were not practical because of the excessive wear on connecting links and the tendency toward shattering of crowns when high peripheral speeds were attained. Best success was had with over-the-row paddles 12 to 14 inches long including the rubber tip, with paddles of heavier chain 2 to 4 inches longer beating in the corrugations and between the rows.

The longer heavier chains used in the corrugations and between the rows proved well worth while in that all weeds and tops were shredded to 3 inch or smaller lengths, which made them small enough to drop out through the bars of the elevator chains of the loaders. Delivered trash is nearly negligible where between-the-row beater paddles are used, and though power demand is increased somewhat the increase is not to the point of troublesome overload of standard equipment, unless too much of the chain is allowed to dig in the dirt.

The paddles found to be the best in terms of hours of life were made from cleat material for conveyor belts, cut into 8 inch lengths and attached to short lengths of 5/16 inch log chain. This material was 5/8 inch thick and 2 inches wide with ply center, rubber covered except where cut. When new material of this type was used the time of usable life approached 30 hours or nearly 20 acres of topping. Where old cleats were used on which the rubber coating was worn off the hours of life were approximately $\frac{1}{4}$ that of the new material. This same proportion was evident, in all types of rubber covered, ply-centered materials tried. When any ply was exposed, the tendency was for the material to split and become useless in a very short time.

Steel cable shows some promise as a beater paddle where tops are small allowing lower r.p.m.'s than average to prolong the hours of usable life. When cable is used a piece twice the length of the paddle wanted is

inserted through the attachment device and usually clamped with an ordinary cable clamp, allowing the strands to separate into a semblance of a wire brush. During field trials the clamp was often omitted, merely bending the cable in the middle to insure its centering in the attachment link.

Leather paddle tips and sections from car or truck tires were so short lived as to be classed as emergency material only. Until such time as a moulded rubber paddle with an embedded metal attachment block can be secured or cable found that has more hours of life than those tried, the present beater paddles can only be defined as makeshift.

With the types of beater paddles used in 1946 the conclusions indicate that when r.p.m.'s of beater shafts are maintained at between 600 to 800, the ground speed should be maintained between 2 and 2½ miles per hour. Slower than this will cause undue breakage and shattering of the crowns, while faster ground speeds than this will cause incomplete topping and necessitate additional trips to get a satisfactory topping job.

Speeds within these ranges with proper beater paddles and height adjustment to fit the field condition, will give sufficient shredding of weeds and tops to allow practically no lifter plugging or excessive trash delivery, and permit delivery of uniformly topped beets.

The use of beater toppers during 1946, indicated that beaters alone were not enough for satisfactory topping in all conditions. The amount of power required to completely remove all the top-center bud, was much more than the amount of power required to remove the balance of the top, and there was no chance of salvaging any tops for stock feed. As a result the conclusion was reached that the ideal use of beaters for topping would be as a follow-up operation, or in conjunction with a conventional type topper. Allowing the topper only a shallow cut thereby removing the bulk of the foliage to a windrow for feeding purposes and cutting off the top center bud to permit complete cleaning of the balance of the crown for "streamer" free, trash free, delivered beets.