The Performance of the 1951 Models of the Molnau Screen

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This past season the American Crystal Sugar Company had a total of 17 Molnau screens in operation in the following districts: East Grand Forks, Minnesota, 2; Chaska, Minn., 9; Mason City, Iowa, 1; Missouria, Montana, 3; Oxnard, California, 1, and Clarksburg, California, 1. Careful observations were made in all areas and accurate comparisons of dirt removal were kept wherever possible. As a general statement, all areas have a high regard for the ability of the Molnau screen to remove trash.

In addition to removing more trash than other screens, tests also show that more dirt is removed by the Molnau, since trash alone would not account for the increased weight of material recovered from the screen.

The widespread distribution of these screens in areas with different soil types and harvesting conditions gave the Molnau screen a thorough testing. An early freeze in the Iowa-Minnesota area disrupted comparative tests which were being conducted there. However, Missoula, Oxnard and Clarksburg were able to obtain valuable information comparing the Molnau with other screens.

At East Grand Forks, Minnesota, the Molnau screen was found to be very efficient for removing trash under dry conditions; however, difficulty in clogging was experienced under wet soil conditions due to the sticky gumbo in the Red River valley. Mention was made also of the fact that the Molnau screen is difficult to clean when clogged, due to its tubular construction.

Missoula, Montana, reported no mechanical difficulties whatsoever, and the 1951 model did not clog as readily as the 1950 model.

Type of Dump	Type of Screen	Average of tare
	1951 Molnau	7.0
1945 Silver Filer	Open Reinks	10.7
1941 Silver Piler	Closed Reinks and blower	8.9
1929 Lynch	1950 Molnau	7.9
1946 Silver Stationary	Open Reinks and blower	10.8
1929 Lynch	1950 Molnau	8.9
1946 Silver Stationary	Open Reinks and blower	11.6

The tabulation in Table 1 compares the 3 Molnau screens operated in Missoula in 1951 with other screens at the nearest stations. These figures are average for all beets delivered to the station concerned for this year:

As shown in Table 1, the Molnau is favored 3.7 percent in the first comparison, 1 percent and 2.9 percent in the second comparison and 2.7 percent in the third comparison.

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The Chaska, Minnesota, area has had several Molnau screens in operation for the past three years. Those people report no mechanical difficulty during that time and the screen has done an excellent job of trash removal and cleaning. Less work stoppage was experienced with the Molnau screen than with any other screen used.

At Mason City, Iowa, the Molnau screen is highly recommended for its trash-removing abilities under extremely dirty conditions. Some difficulty was encountered with partial clogging on the tail end bearings. Correction of this difficulty will be discussed later. The overall performance of the Molnau screen *in* this area was excellent.

At Oxnard, California, a very complete test was conducted comparing a 6-ft. Molnau with a 6-roll Reinks having no reverse rolls.

Various pitches were used on the Molnau screen in an attempt to determine the proper setting for local conditions. Pitches of 2, $2^{3/4}$ and 2⅝ inches per foot were tried with a speed of 150 RPM on the screen.

When the Molnau screen was first installed, it was visibly noted that it was removing more loose trash and leaves than the Reinks; however, from the results of actual tests shown in Table 2, the difference in tare weight indicated that it was actually removing more dirt, for the weight of leaves and trash alone would hardly account for the increase in recovery shown by the Molnau screen.

Table 2.

Type of Screen	Number of Loads	Number of Tons	Percent of Dirt	Percent of Top Tare	Net Recovery
Random Loads from All Growers					
	Sept. 3 to 8 incl.		Pitch 2⅜" per foot		
Reinks	391	3120	2.987	3.99	93.14
Molnau	330	2499	4.156	5.87	92.14
	Sept. 10 to 15 incl.		Pitch 2⅛" per foot		
Reinks	382	3029	2.481	3.98	93.54
Molnau	337	2584	3.383	4.13	92.63
	Sept. 24 to 29 incl.		Pitch 2" per foot		
Reinks	596	3106	2.288	4.50	93.31
Molnau	355	2563	3.205	3.94	92.98
The Following Two Tests Conducted on Individual Growers					
	Grower No. 1		Pitch 2⅜" per foot		
Reinks	43	358	1.436	4.85	93.78
Molnau	45	355	2.481	4.27	93.35
	Grower No. 2		Pitch 2⅜" per foot		
Reinks	42	280	1.57	4.44	94.06
Molnau	42	282	2.714	3.23	94.14

The figures in Table 2 are self-explanatory. Except at a pitch of $2^{5/8}$ inches, the Molnau screen shows a lower top tare in all cases. The net recovery is in favor of the Molnau screen with the exception of the individual test No. 2 which was practically even.

The only mechanical difficulty involved was in the drive clutch, which appeared to be too light. A heavier slip clutch is recommended. Under extremely cloddy conditions, clods are inclined to pass over this screen very much the same as with the Reinks.

At Clarksburg, California, more than 216,000 tons were run over a 12-roll Molnau screen with no major breakdowns. An attempt was made to compare results with previous years but due to different harvesting conditions the results were erratic. However, the screen performed very satisfactorily, removing a great deal of excess tops and trash, and, from the operating end, was a great factor in increased slice.

The Molnau screen was used in rather a unique arrangement at Clarksburg. In past years a 13-roll Reinks 7 feet wide with 4 reverse rolls was used, but it was not doing a suitable job with the increased use of mechanical harvesters. In 1951 a 10-foot 12-roll Molnau screen was installed in front of the Reinks for two reasons:

First, for the removal of as much trash as possible by the Molnau screen; Second, spreading the beets so as to have full advantage of the width of the Reinks screen tor improved cleaning. The combination proved to be very acceptable, as 75 percent of the trash and dirt was eliminated before the beets reached the Reinks screen where, due to the spreading action, further dirt elimination was possible.

Summarizing briefly the reports from all areas we can conclude that the most remarkable qualification of the Molnau screen is its ability to remove trash and loose leaves. Comparative tests indicate that the Molnau screen is also efficient in dirt recovery. The pitch of the screen and RPM of the rolls are two big factors contributing to maximum performance. Dirt accumulating in the rolls does not hinder the performance of the screen, except under extremely sticky soil conditions which cause a buildup greater than the circumference of the roll itself. The Molnau screen will clog under these conditions and cleaning is difficult. Under excessive cloddy conditions there is a tendency for the clods to pass over the screen much the same as a beet.

With the increased amount of mechanical harvesting each year, it appears that the Molnau screen has its place in beet receiving equipment, through maximum utilization, to maintain and perhaps increase average daily slices enjoyed previously in processing hand-topped beets.

To help eliminate the grass and leaves, pegs were welded on the rolls. These pegs snag and carry the trash through the screen. Originally about 10 *1/2* inch x *1/2* inch x *1/2* inch pegs were used per roll and no set pattern followed. As the importance of these pegs became apparent, further study and experiments were conducted.

The best results were achieved by using 26—*3/8* inch x *3/8* inch x *3/4* inch pegs placed in a scroll pattern around each roll. All 1951 screens were constructed with this type of roll.

At no time has there been any appreciable loss of tailings between the bed rolls of the screen, the tendency being for these to be carried to the outside rolls. Because of this it was decided to allow more space between these rolls (from 1 inch to 1 1/16 inch). This spacing will be increased, to $1^{3/8}$ inch in the 1952 model, with the exception of the center spacing.

To date all screens have had the same spacing between the bed rolls. Due to the extremely wet and muddy conditidn this past year, there were

times when these rolls would build up until there was no clearance between the rolls, this being especially true at the center rolls due to the bulk of the beets coming off the belt at this point. To overcome this in the future, wider spacing will be made between the 2 center rolls (an increase from 1 1/16 inch to $1\frac{1}{2}$ inch), the thought being that the accumulation can at no time be greater than the spacing between this roll and the one next to it which rotates in the same direction, thus assuring spacing between these two rolls at all times.

To ease the difficulty we were having with the tailings and trash at the edge of the screen, the outer elevated roll was raised and brought in so that the inner facing of this roll was directly in line with the center of the last bed roll, providing more clearance between the roll and the housing. The spacing was increased from 1 inch to $1\frac{3}{8}$ inches.

The scroll on this elevated roll was also changed from one which fed the untopped beets and trash directly to the discharge end to a two-way scroll. The scroll on the lower 3/4 of this roll was reversed. This tended to bring the untopped beets and trash back up the screen, eliminating much of the congestion experienced with the earlier models and at the same time giving the screen further opportunity to remove tops, etc. The scroll on the upper end of this roll fed downward and where it joins the reversed scroll they were overlapped, developing more aggressive cutting action. The result of these changes were very satisfactory. Additional increase in the spacing from $1\frac{3}{8}$ inches to $1\frac{5}{8}$ inches will be made on the 1952 screens and the elevated roll will overlap about 3/4 of the last bed roll.

It is obvious from the data brought out earlier that the Molnau screen performance is in most instances superior to that of all other screens in our districts and if the design of the screen as originally fabricated by Mr. Molnau had been followed, the screens which were manufactured by Silver Engineering Works would have performed equally as well. One of these Silver Engineering fabricated Molnau screens was installed at Mankato, Minn., and after two years of use and various changes having been made to it, endeavoring to covercome its weaknesses, it has now been decided that it must be dismantled and rebuilt to conform with the screen design as originally developed by its inventor.