2012 Maple Tubing Research

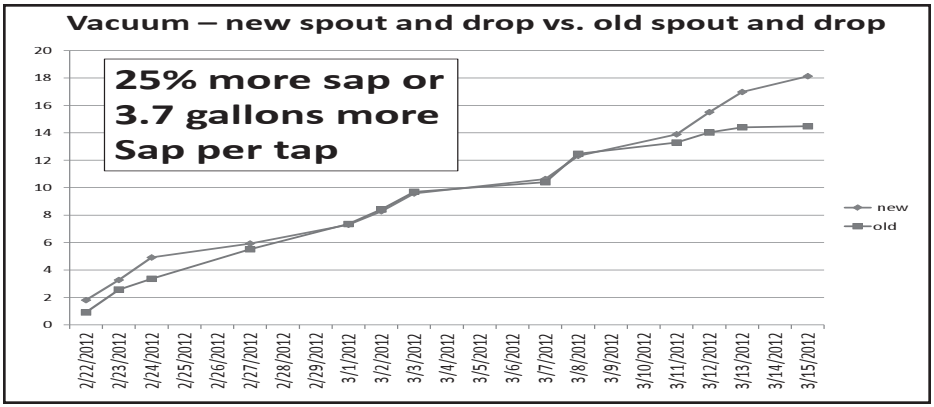
by Stephen Childs, NYS Maple Specialist

In 2012 a variety of spout and tubing cleaning and replacement options were tested to determine the extent of sap yield changes. These tests were done at the Cornell Arnot Research Forest. Treatments except where noted were a direct comparison between a check and a described treatment each with three replications, each replication with 4 to 6 taps, both treatments in the same tree, spaced about 10 inches apart at the same elevation and same basic orientation. The check was usually represented by an old spout and old drop, having been used each season for at least 10 years or in a few cases by a new spout and new drop. The 2012 season started early with our first measureable sap run occurring on February 21st followed by many small runs and temperatures only reaching 50º F one day until March 13th which was followed by 15 days without a freeze and daily temperatures commonly in the 70s and 80s. Once the sap stopped running on the15th there was no sap run during this warm weather and none of the treatments ran any sap when it finally did freeze again. In the vacuum systems tests the vacuum level was consistently between 21" and 22" Hg. This is 5" to 6" Hg higher than prior years.

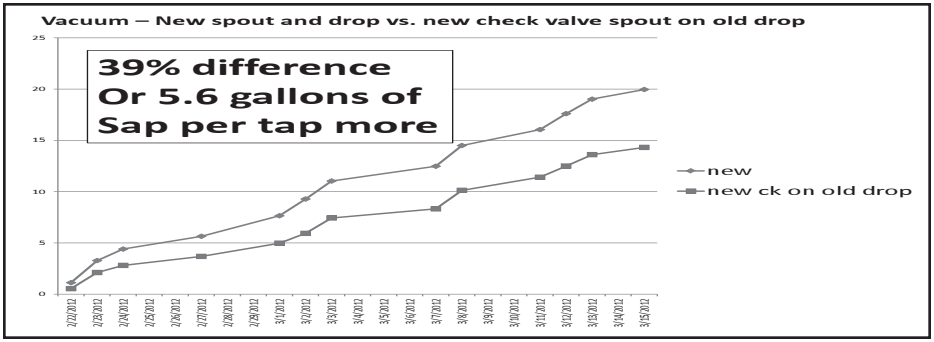
The research goal for 2012 was to first test some rather extreme tubing cleaning or sanitizing techniques to see if by going to extremes we could get old tubing to perform like new. If going to an extreme does not produce significant results then treatments that go just part way will not likely be effective. These extreme treatments include concentrated alcohol washing, boiling spouts in vegetable oil where much higher temperatures can be achieved than when boiling in water and dry heating drop lines to 180ºF for two hours. Second there have been some fairly common spout and tubing combinations that we have not had a chance to try in prior years of testing. These included testing clear spouts and copper spouts.

The standard test of comparing yield from a new spout and drop vs. an old spout and drop (used for at least ten years) was also used as a comparison this year. In all the prior seasons the new spout and drop showed at least an 80% increase in sap yield over the old spout and drop and usually over 100%. With this season ending abruptly with no significant warm weather (greater than 50º F) between tapping and the unseasonal warm up that started on March 13th the old spout and drop had just begun to drop in yield performance resulting in just a 25% or 3.7 more sap from the new spout and drop. The new spout and drop yielded 18 gallons of sap per tap and the old spout and drop 14.3 gallons of sap per tap. This test was conducted at between 21" and 22" of Hg. Both the old and new spouts were black plastic.

A new spout and drop was compared with a new check valve spout on an old drop (in use more than 10 continuous seasons) at the 21" to 22" Hg vacuum, new spouts were black plastic. Here the average yield of the new spout and drop was 20 gallons of sap per tap and the check valve on the old drop yielded 14.8



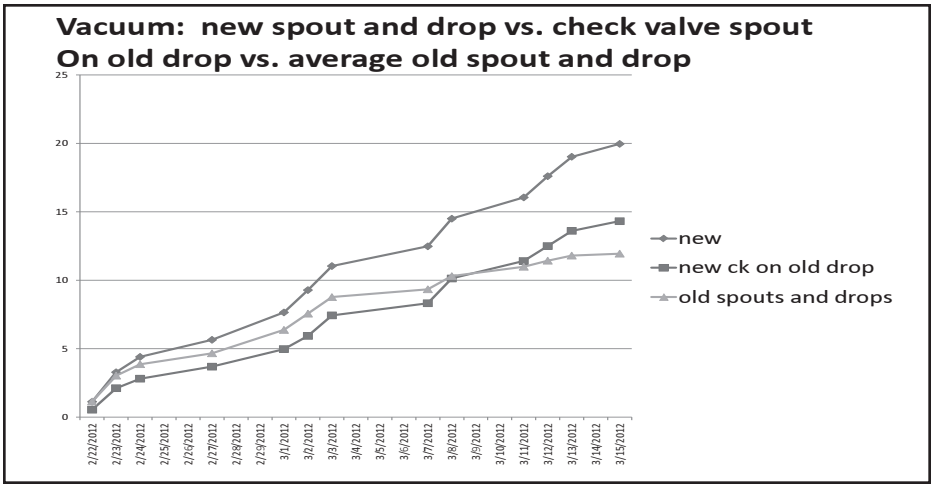
gallons of sap per tap for a difference of 39% or 5.6 gallons of sap per tap more with the new spout and drop. In these replications the difference between treatments started right from the beginning of the season which is not what we have consistently seen in most all comparisons which are normally the same early in the season followed by the spouts that best protect the tap-hole from bacteria and yeast sustaining sap yield while old equipment contaminated with bacteria and yeast begins to reduce sap yield once temperatures above 50ºF are observed. This difference from the normal pattern of results make me suspect that this treatment had some poor tap holes or restriction issues that I was not able to identify.



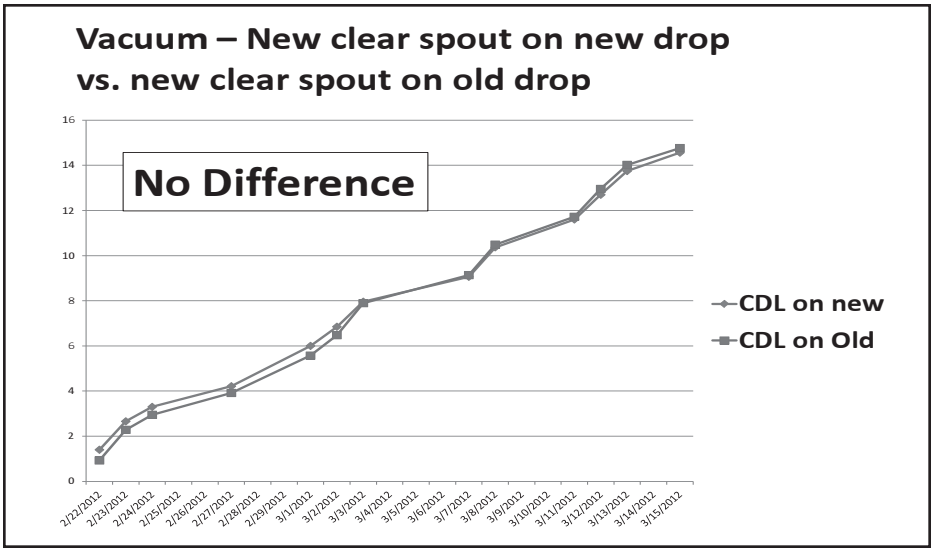
When the new check valve is also compared to the average of new spout and drop results and the average old spout and drop for all the treatments and replications in the sugarbush check valve treatments yielded about a 3 gallons of sap per tap advantage over the old spout and drop treatments.

Treating maple tubing with an alcohol wash prior to the season did not show any yield improvement under vacuum or on a gravity system.

A new clear poly carbonate spout with new drop was compared to a new clear poly carbonate spout on an old drop with no difference. Both treatments yielded about 14.5 gallons of sap per tap. The problem here is that both of these treatments averaged only 14.5 gallons of sap per tap or very near what

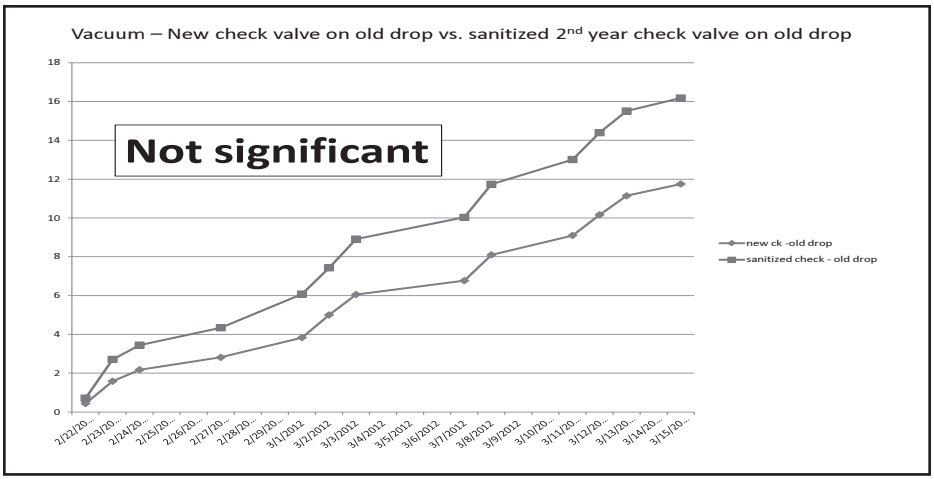


the old spout and drop yielded in other tests, less than where the black spouts were used with new tubing. It is obvious that more tests and more seasons are needed to examine these differences to conclude if clear spouts or black spouts offer some kind of clear advantage.



One of the questions that consistently comes from maple producers is can the check valves be cleaned and reused? Traditionally the results of trying to clean plastics in the field have not been successful at getting like new response. In the case of check valves they can be transported back to the sugarhouse and handled more easily than trying to return the whole tubing system. In the sugarhouse or at the farm there are more cleaning and sanitizing options available. In this next test check valves that had been used in the 2011

maple season were cooked in vegetable oil at 300ºF for 15 minutes then washed with soap and, completely rinsed, dried then checked to be sure the check valve ball was in place and able to move freely in the channel. The hot oil was used to get to a hotter temperature than would be offered by boiling water. It was also to test what physical characteristics would change in the spout when exposed to the higher heat. The higher temperature did release some of the check valve balls from the spout at about 15% rate. Otherwise the spouts showed no negative results of being boiled in the hot oil. The results are surprising. The sanitized check valve spouts averaged about 4 gallons of sap more than the new check valve spouts but the reps were not consistent indicating that this test would not be significant or this average difference would not be expected consistently. Again with the unusual season no conclusion can be drawn from this one set of tests. More seasons of testing are needed to draw any realistic conclusion. Again the differences started right in the beginning of the season rather than being time and temperature induced so sanitation is not the likely cause.

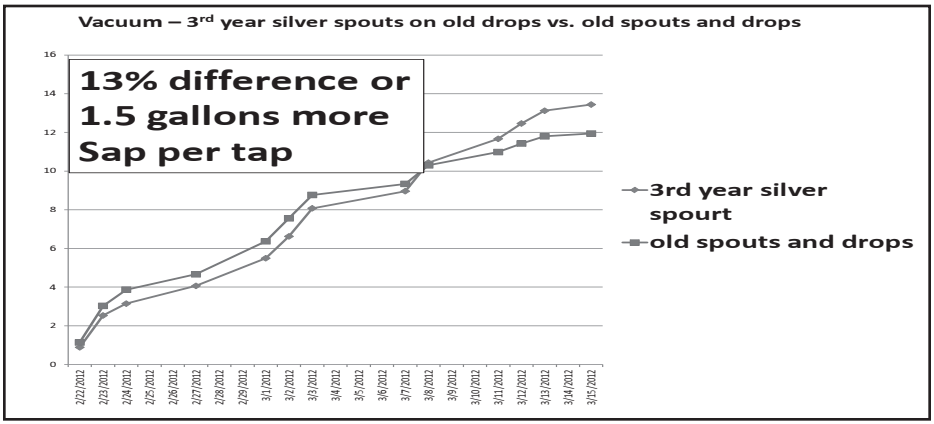


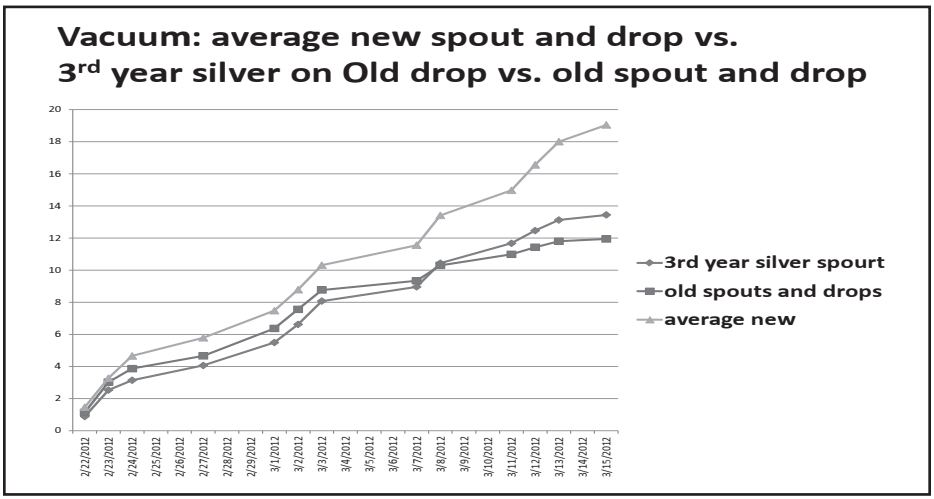
For two years the silver spouts have given about a 70% increase in sap yield in their first and second year of use. In 2012 they were used for the third year in a row and produced a difference of just 13% or 1.5 more gallons of sap per tap. Testing in the fourth year should better indicated if the spouts have lost much of their effectiveness or the sudden end of season was the reason for the smaller result.

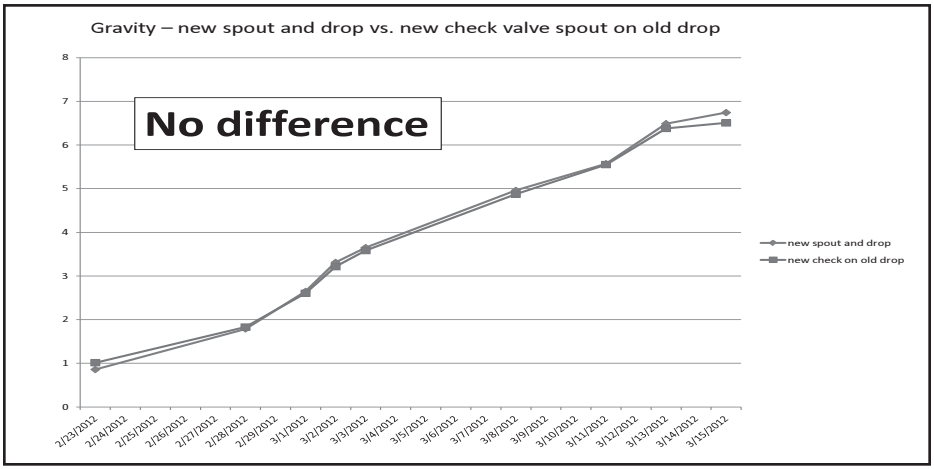
When compared with the average of new spouts and drops in the sugarbush it would indicate that it was not all due to the unusual season. The new spout and drop averaged 19 gallons of sap per tap, 3rd year silver averaged 13.8 gallons of sap per tap and old spouts and drops averaged just 12 gallons of sap per tap as seen in the chart on the next page.

A series of tubing without vacuum tests were also conducted in 2012.

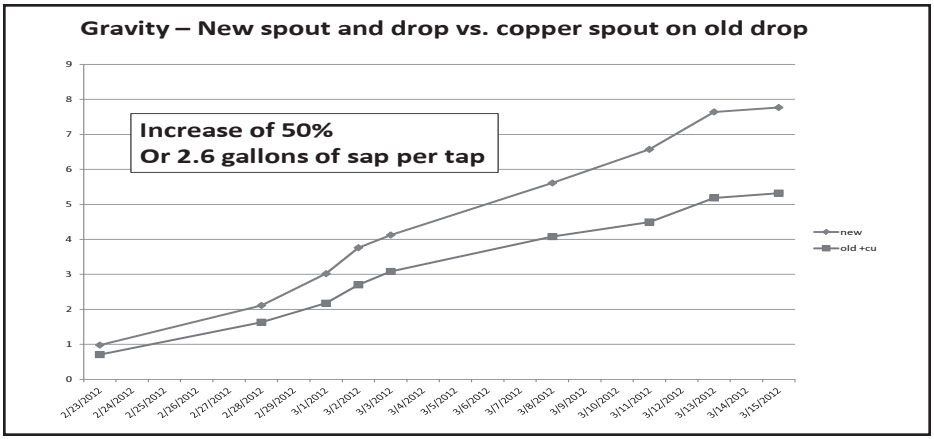
Under gravity the new spout and drop vs. a check valve on an old drop resulted in no difference in the yield.

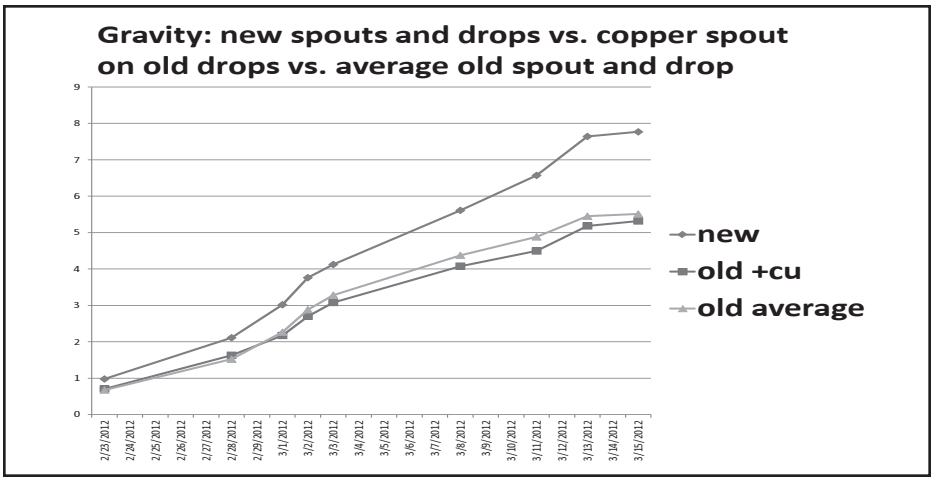

Vacuum – 3rd year silver spouts on old drops vs. old spouts and drops
13% difference or
1.5 gallons more
Sap per tap
3rd year silver spourt
old spouts and drops


Vacuum: average new spout and drop vs.
3rd year silver on Old drop vs. old spout and drop
3rd year silver spourt
old spouts and drops
average new


Gravity – new spout and drop vs. new check valve spout on old drop
No difference
new spout and drop
new check on old drop

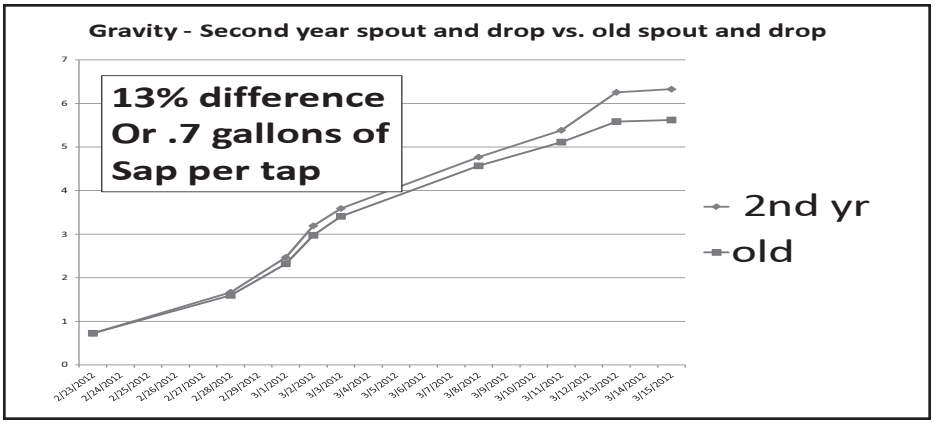
A test was run where a new black spout and new drop was compared to a new copper spout with an old drop. The copper spouts performed the poorest of all treatments resulting in just 5.2 gallons of sap per tap for the season while the new spout and drop produced 7.8 gallons of sap from the same tree.

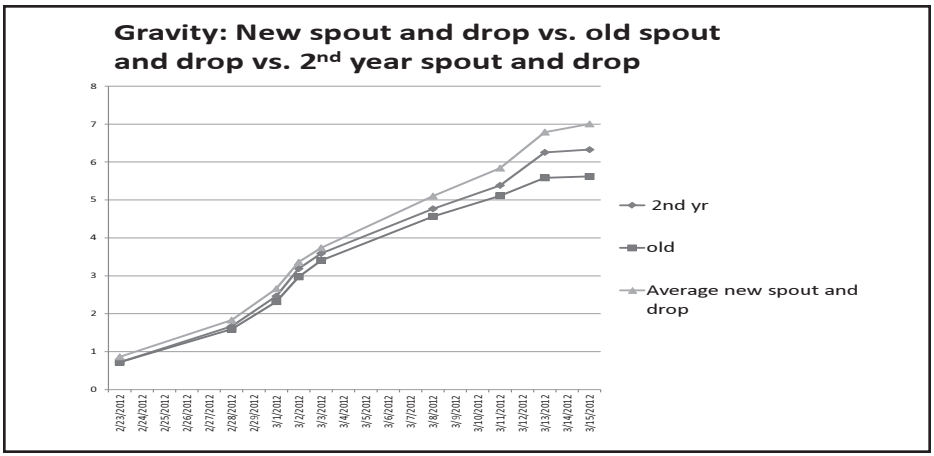




The question of how long does the effect of a new spout and drop last was again tested in 2012 where a second year spout and drop was compared with an old spout and drop with only a gain of .7 gallons of sap per tap or 13%. Over the years this has been tested this difference is the most inconsistent of all the tests tried. Generally a second year spout and drop is much less than new but still better than old.

In looking for ways to clean and sanitize used tubing so that the tap will yield like it would with new spout and drop has lead to some extreme attempts at finding what the limits are on tubing treatments. In this experiment droplines that have been in continuous use for over 10 years were baked in an oven at





180ºF for two hours were compared with new droplines. In this case both the new droplines and the heated droplines were connected with the taphole with a new black plastic spout. In this test the new droplines with new spout yielded about 6.5 gallons of sap per tap while the heat treated droplines with new spout yielded about 5.6 gallons of sap per tap or about 16% less yield. In order to accomplish this kind of treatment the maple producer would have to remove all of the droplines and take them to a treatment site then return them to the trees. For this amount of work a bigger difference would be necessary in order to be financially profitable. This test should be conducted again as many of the taphole sanitation practices did not have a chance to enhance yield due to the unusual weather as they have in all the other years testing. See figure on next page.

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