

AVOIDING EQUIPMENT TROUBLE *reprinted from Farming, the Journal of Northeast Agriculture*
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The maple conference held in Hyde Park, Vermont on January 23rd, 2010 (one of three held in Vermont in January) was attended by over 340 sugarmakers who learned about forest management, vacuum, reverse osmosis, boiling, quality control, marketing, and a host of other subjects. Two well-attended presentations were by Nick Atherton, the service manager for Maple Pro of St. Albans, Vermont. Nick is one of the most knowledgeable professionals in the maple industry and has been visiting maple operations and solving equipment problems for over 15 years. His talks centered on reverse osmosis and vacuum. The following is my attempt to summarize some of the information that he shared.

Because Nick is the service manager, he is often called to visit operations where the sugarmaker thinks that his equipment has broken down due to some equipment flaw or damage. In reality, many of these problems and the resulting calls for service can be avoided by proper maintenance and by understanding how the machines operate and their limitations. With reverse osmosis (RO) machines, there are at least two important concepts to remember. First, that the stated capacity of a machine and its membranes are for 55 degrees F, and the capacity will drop considerably with colder sap (perhaps to 75% capacity with very cold sap), even though the RO is well maintained and functioning correctly. Second, RO machines that are not maintained properly will not concentrate at their stated capacity. Here are some of the problems that Nick frequently sees when producers report a problem: 1) undersized wiring connected to the machine or an undersized service to the building; 2) plumbing undersized or sloppy; 3) heating and draining issues in the RO room; 4) pumps freezing; 5) pressure switches sticking because the machine was not washed and drained thoroughly at the end of the season; 6) plugged feed pump; and 7) fouled membranes.

Nick emphasized the special attention that membranes need in order to prevent damage and lost capacity. There are several possible membranes that individuals might be using, and each has performance and maintenance parameters specific to that model. Operators must learn how to check the performance of their membrane and to understand its limitations, knowing for example, that more sugar will pass into the permeate with higher flow membranes. Operators can develop a wash procedure that works for them, as long as they understand that the objective is to clean the membrane, not to shorten the procedure. Do not let the membranes foul to the point that they cannot be washed back to the performance seen at the beginning of the day, or a permanent loss of capacity could occur. Objectives of the wash should be 1) to recover the concentrate that is in the system; 2) to give a complete pre-rinse; 3) to wash with the correct amount of soap; and 4) to wash at the correct pH. If the wash water looks very dirty, this could indicate a

lot of fouling of the membrane, but also that the soap is doing its job. In this case, depending on the membrane type, a second wash may be a good idea. End of season maintenance should include an end of season wash and if necessary, a professional membrane cleaning. It is also necessary to store the membrane properly and keep it from freezing.

Nick also gave a presentation on vacuum pumps and extractors. Similar to RO's, he felt that many of the service calls that he attended were not related to faulty equipment, but to a need for better equipment maintenance. Some of the points he emphasized in his talk included: avoid wiring size that is too small for the motor. Keep the plumbing connections as short as possible. With vane pumps—either farm pumps or oil flood models—do everything possible to avoid the pump getting hot; for example, direct a fan at the pump. The oil and its filter should be changed every year. The oil reclaimers in a flood pump contain a big filter, which can get plugged—this would be indicated by any pressure in the reclaimer. Water cooled liquid ring pumps, which use water to form the vacuum seal inside the pump, need to have cool water (under 65 degrees F) to maximize the vacuum. Water in these pumps should be drained at the end of the season and replaced with something like RV antifreeze with rust inhibitor. Extractors need a few minutes of maintenance every day. They need to be cleared of ice before the sap begins to run, and the moving parts need to be frequently lubricated with food-grade silicone. Old lubricant can be cleaned out with dish detergent. A mechanical releaser needs an adequate shelter that protects it from rain and sun. Electric releasers that use a pump to evacuate the sap need to be in a heated room. Vacuum leaks between the extractor and the pump are often a problem. A strainer between the extractor and the pump is a good idea.

Finally, Nick stated that one of the common issues from which problems arise is when a producer has found a deal on a piece of equipment that doesn't really fit their application, and for which there is no manufacturer support.

In summary, modern maple equipment such as a vacuum pump or RO, purchased for a considerable sum, is worthy of a considerable investment in time in order to understand its operation and keep up with the necessary maintenance. Well maintained equipment will result in fewer problems and service calls, and will allow the operator to take full advantage of the efficiency that the equipment can provide.