dairying

How to make sense of your

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There's great peace of mind from knowing your milking machine has been serviced and tested. Normally, testing is done once a year after servicing; however, if there is a problem with mastitis or cell count, test the milking machine before servicing followed by a second test after servicing. This will highlight any faults that may be causing problems and show that they have been fixed.

Your milking machine technician should write a test report showing the results recorded and listing any faults and recommendations.

He should discuss the results with you and leave you a copy of the report. This does not always happen because, usually, there are no further issues to sort out after servicing. However, you should always receive a copy of the test report. It is important to keep this in your files. It can be checked if anything goes wrong in the coming year and it can also be compared with previous years test reports to see if they correspond.

Milking machine testing should be done by an IMQCS (Irish Milk Quality Co-operative Society) registered milking machine technician.

IMQCS oversees the training and registration of milking machine technicians and others involved in servicing, installing, testing and/or solving milk quality problems with milking machines. The full list of those on the register is on www.milkquality.ie

Vacuum tests

The milking technician uses an accurate test gauge to check the working vacuum of the milking machine. He will also confirm that the vacuum gauge on the machine is reading correctly. The vacuum level should typically be set between 47 and 48.5 kPa.

Always check the vacuum gauge at milking time to ensure that the correct vacuum level is maintained. The gauge should read zero when the machine is off.

A red line on the gauge can be set at the desired vacuum level and as long as the needle on the gauge lines up with the red line during milking, you can see at a glance that all is well. In the past year, I have come across a machines with vacuum levels ranging from 51kPa to 54kPa. Serious mastitis and cell count problems will result from these high levels.

FIGURE 1

IMQCS MILKING MACHINE TEST REPORT

Vacuum and Airflow Test Results

FIGURE 2

DATE: 23-05-13	
PULSATOR 11	SIM.
VACUUM LEVEL	46.5 KPA
PULS	60.3 P/M
	995 MS
A+B PHASE	67.8 %
	675 MS
C+D PHASE	32.2 %
	320 MS
A PHASE	13.1 %
	130 MS
B PHASE	54.8 %
	545 MS
C PHASE	9.8 %
	98 MS
D PHASE	23.1 %
	230 MS

milking machine test report

Key messages

Key details to check in the test report:
- Working vacuum for the machine
- Vacuum gauge accuracy
- Vacuum reserve adequacy and similarity to previous years
- Regulator leakage
- Pump capacity
- Pulsation readings
- Liner change interval

Other items to be checked or serviced:
- Check that claw air bleeds are clean; this should be done daily.
- Check and service seal kits for claws.
- Chipped or cracked claw bowels should be replaced.
- Rubberware should be inspected for cracks and wear — blackening from old worn rubber inside milk tube, perished rubber, flattening, holes, restrictions and pinches. Short pulse tubes between the shells and the claw are prone to damage causing leaks that reduce vacuum reserve and allow dirt to be sucked in. This dirt may adversely affect the pulsation.
- Drain valves on airlines should be free to drain when the machine is off. The pulsation airline should always have a drain valve at its lowest point. It should automatically seal during milking and should open to allow any liquid in the line to drain out when the machine is turned off. The airline should slope towards the drain valve.
- Have an even and continuous slope in the milkline. Milk lines must have an even slope of at least one in a 100 (1%) towards the receiver, preferably one in 67 (1½%).
- Avoid excessive loops of milk tubes into the pit.
- Check vacuum pump oil regularly and oil drop rate.
- Have automatic cluster removers serviced and calibrated by your milking machine technician so that cows are fully milked out but not over-milked and vacuum shut off and cluster removal are timed correctly.

Figure 1 shows a section of a test report with the main vacuum and airflow results.

The working vacuum is 47kPa, which is fine. The plant gauge (vacuum gauge on the machine) is reading the same as the test gauge so the plant gauge reading is correct (i.e. zero error).

The pump capacity is 1,480 litres/min, which is in line with the estimated pump capacity required (1,426 lit/min) for a modern 10-unit pipeline machine.

FIGURE 3

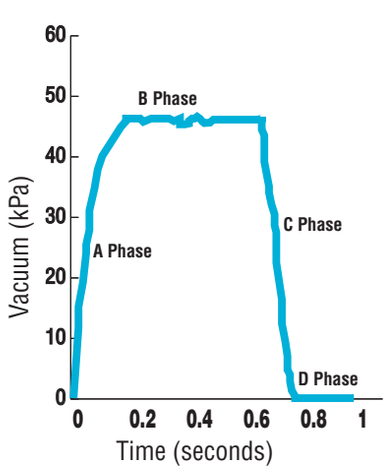

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FIGURE 4


Pulsation Test Results

Your technician should attach the printout of the pulsation test results to the test report or summarise them in this section of the test report as shown above.

FIGURE 6


Liners

FIGURE 5

RIGHT: An airflow meter is used to check vacuum reserve. This is an essential test to ensure the milking machine is working properly.

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The effective reserve is 1,090 litres/min, which is well above the effective and cleaning reserve recommended for a modern 10-unit machine. It should be more or less the same from year to year. Effective reserve is the ability of the vacuum pump to maintain vacuum when a cluster falls off or if excessive air is admitted while putting on a cluster.

The difference between the manual and effective reserve (9-10) shows up any leakage through the regulator. Here, it is 20 lit/min; well within limits. The regulator opens and closes to maintain vacuum at the set working vacuum level. Regulator leakage is the leakage that occurs when the regulator is closed. If a cluster falls off, the regulator closes in order to maintain vacuum, but if it is faulty or very dirty, it will leak in too much air and reduce vacuum reserve.

Pulsation tests and results

Figure 2 shows the results of a pulsation test in percentage and milliseconds for one unit. It also shows the peak vacuum level when the liner is open. This should be the same or almost the same as the working vacuum for the machine. If different, it could indicate obstructions or leaks in the pulsation tubes on the way to the cluster.

The rate is the number of times the liner opens and closes per minute. Here, it is normal at 60.3 cycles a minute or one cycle per second.

The pulsation cycle consists of four phases, A, B, C and D. A is when the liner is opening and, in this case, it takes 13.1% of the cycle. At B, the liner is fully open and milk is flowing, 54.8% of the time in this case. C takes up 9% of the cycle time as the liner closes and at D the liner is fully closed around and below the teat. D here takes 23.1% of the cycle time which is a very good reading. The ratio is a value often referred to and is a combination of the A and B phases together.

Figure 3 shows the same results in the form of a graph. The graph shows the vacuum level of each phase throughout the cycle. Time is measured along the bottom and vacuum up the side. Typical values for pulsation are: AB 65% to 68%, CD 35% to 32%, A 13% to 17%, B 48% to 55%, C 8% to 13%. Your technician should print out the results of the pulsation tests and either attach them to the test report or summarise them in the space provided on the test report sheet — see *Figure 4*.

What I have shown above are the results for just one unit. There will be a lot of pulsation readings available when a complete machine is tested. It is important to check every reading for every unit to ensure that all are within limits.

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Changing liners

Figure 5 shows what should be recorded about the liners. Liners should be changed every 2,000 cow milkings. So, if you are milking 70 cows with 10 units twice a day, the liners should be changed after roughly 150 days or twice a year (i.e. 2,000 divided by seven milkings per unit for two milkings = 2,000 divided by 14 = 143 days).

Use liners suitable for the shells, e.g. the mouthpiece should not be loose on the shell. Old liners can cause longer milking times and are inclined to close off the teat at the based of the udder which will depress milk yield. Under-milking due to worn liners can contribute to increases in cell count. Liner tension lessens as they get older.

When you are changing, cut open a few liners to see what condition they are in. If they are long overdue a change, you may find roughness and distortion where the teat lies. The shape will be oval and the imprint of the teat can be seen. You may see hair cracks and greasiness from milk fat residues. A new liner placed beside an old one will be shorter. If you see milkstone on the inside of the liner, it indicates a big problem with your cleaning methods and the roughness can't be doing the condition of the teats any good either.