



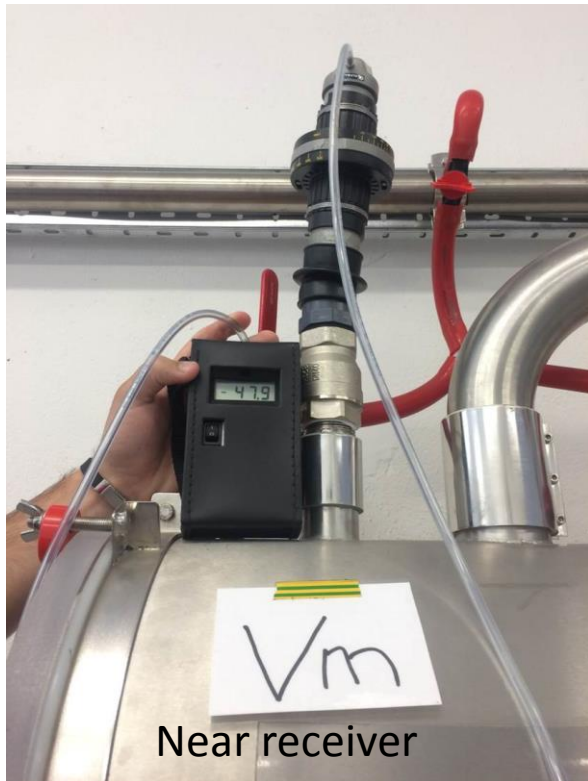
IMQCS Refresher Seminar 2017

Milking Machine Testing Procedures

Tom Ryan, Teagasc

Working Vacuum

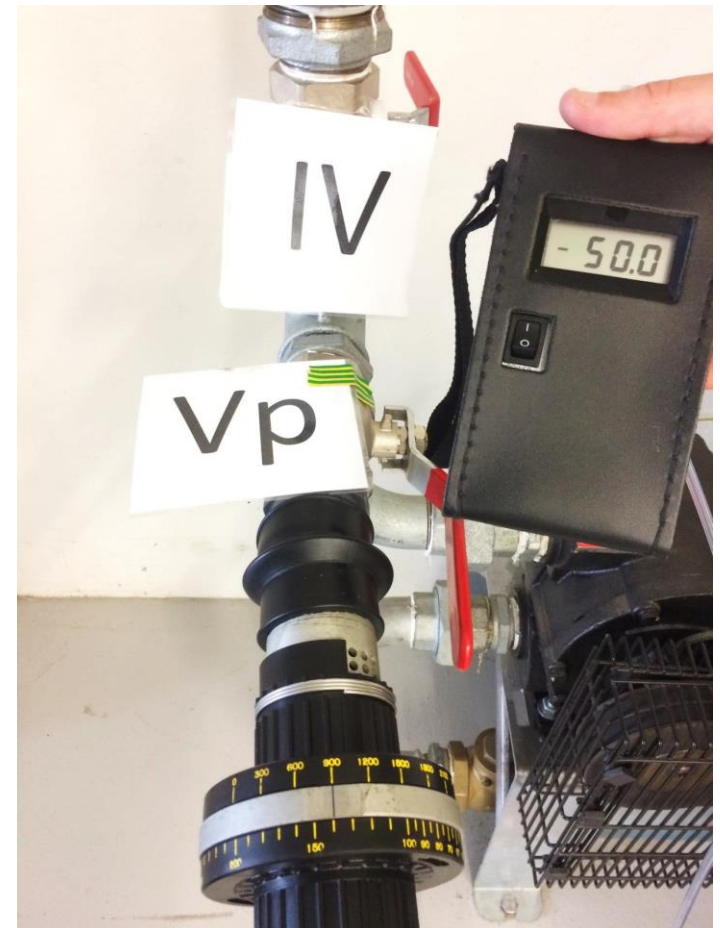
- Working vacuum at V_m – receiver. No.1 on test report
- Working vacuum at V_r – regulator. No. 1a on test report
- Working vacuum at V_p – pump. No. 1b on test report
- Machine in milking position – liners plugged for all



Pump capacity

- Get working vacuum at Vp first (48.3kPa here)
- Machine in milking position – liners plugged
- Test gauge at Vp
- AFM direct to pump (1090 lit/min here)
- 2 on test report - **bold item** – record results

- Capacity at 50kPa
- 2a on test report
- Non-bold item
- Close in AFM to bring vacuum to 50kPa
- 1040 lit/min here





Vacuum Gauge

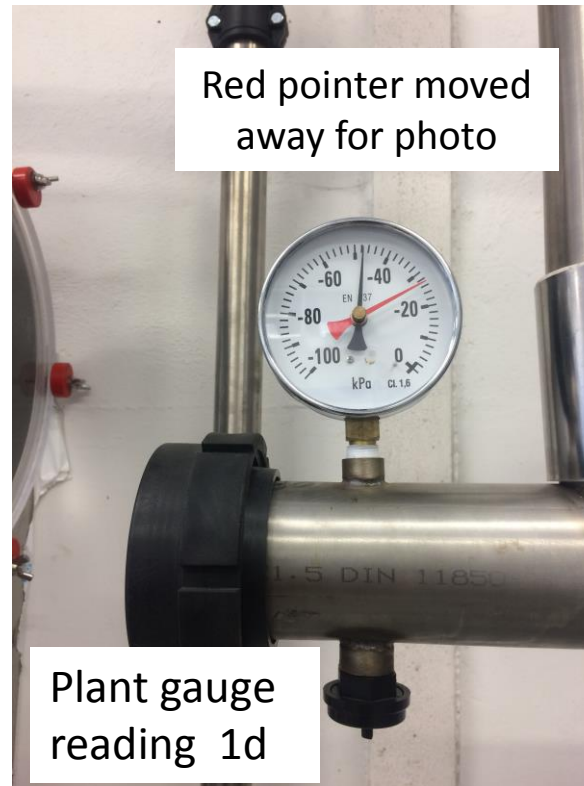
- Set to correct vacuum level
- Gauge easy to see during milking
- Set red pointer to working vacuum level
- Always check vacuum gauge accuracy
- Zero when machine off
- More than one gauge may be needed
- Never leave a machine without a gauge or with a faulty gauge.

Plant vacuum gauge accuracy

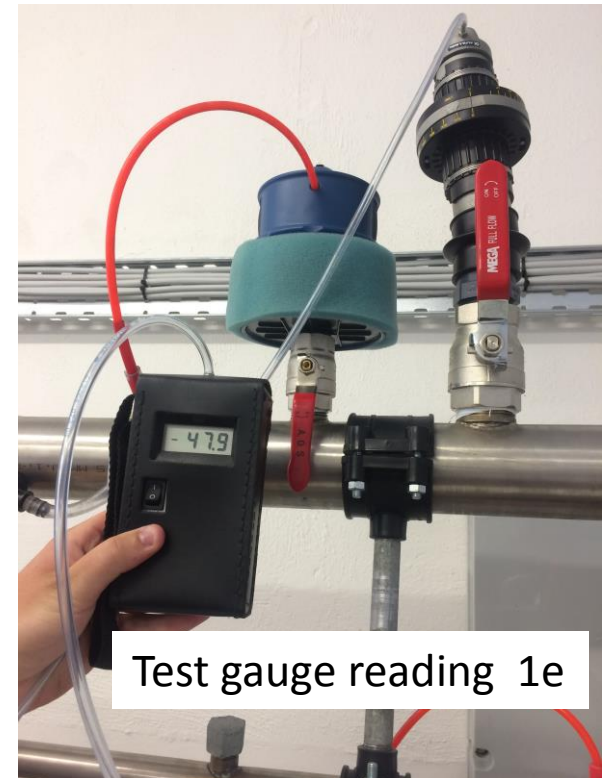
- 1d and 1e on test report
- Have machine ready for milking
- Test near the plant gauge at Vr
- Plant vacuum gauge accuracy is 1d-1e
- Gauge error not to exceed 1kPa



Machine ready for milking



Plant gauge reading 1d



Test gauge reading 1e

Effective reserve

Effective reserve (l/min)

- Have machine in the milking position
 - liners plugged
- Regulator(s) added
- Test at A1 and Vm (if no A1 and Vm test at A2 and Vr)
- Record working vacuum at Vm first
- Open AFM to drop vacuum 2kpa below working vacuum at Vm
- Record results at No. 10 on test report

- Test at A1 and Vm
- Record working vacuum at Vm first



- See tables in manual for required effective reserves, etc.

Manual reserve, regulation loss and regulator leakage

Manual reserve (l/min)

- Have machine in the milking position – liners plugged
 - Regulator(s) plugged (fully isolate)
 - Test at A1 and Vm (if no A1 and Vm test at A2 and Vr)
 - Record working vacuum at Vm first
 - Drop vacuum 2kpa below working vacuum at Vm
 - Record results at No. 9 on test report
-
- Regulation loss No. 9 – No. 10
 - Regulation loss 35l/min or 10% of manual reserve whichever is greater
 - Regulator leakage 35l/min or 5% of manual reserve whichever is greater

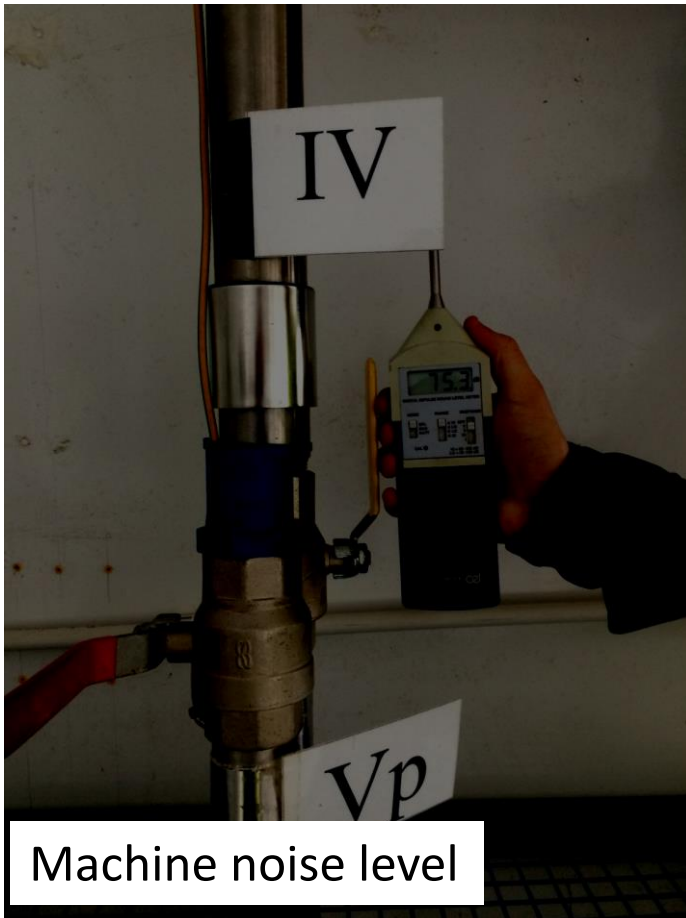
- Test at A1 and Vm
- Record working
- vacuum at Vm first



Regulator(s) plugged (fully isolate)

Noise levels

- Noise levels increase up to 117dB when valve opened to turn off the machine – sudden rush in of air.
- Noise levels over 105dB from AFM whistling sound.



Machine noise level



Test valve opened –
noise increases for an instant
up to as much as 117dB

Pulsation tests

- Test all units
- Check all values
- Record results in test report
- Record max and min values
- Compare “b” phase vacuum to working vacuum – ideally use same vacuum gauge for each
- Are max and min values within limits

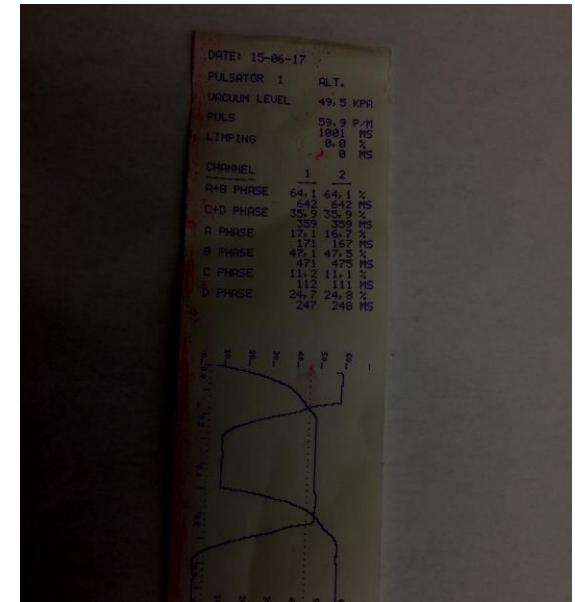
position (liners plugged), test at A2 and Vr or Vp
Claw air admission (4-5)

Pulsation Test Results		
Rate c/min	Max	Min
“b” phase vacuum kPa	Max	Min
Ratio “a+b” % or ms	Max	Min
“a” value % or ms	Max	Min
“b” value % or ms	Max	Min
“c” value % or ms	Max	Min
“d” value % or ms	Max	Min

Pulsation printout attached: yes/no _____
Simultaneous or Alternate _____
Limping (< 5%) _____

Faults

Recon



Pulsation tests are **bold** items on report

Other important bold items

IMQCS MILKING MACHINE TEST REPORT

IMQCS INTERNATIONAL MILK QUALITY CO-OPERATIVE SOCIETY

Name _____ Address _____ Date _____ Plant Type _____
 No. of units _____ Tester's Signature _____ IMQCS Reg. no. **43118**

Vacuum and Airflow Test Results

1. Working vacuum at Vm; machine in the milking position (liners plugged) _____ kPa
 Working vacuum recommended with the machine in the milking position (liners plugged) _____ kPa
 1a. Working vacuum at Vr; machine in the milking position (liners plugged) _____ kPa
 1b. Working vacuum at Vp; machine in the milking position (liners plugged) _____ kPa

6. Airflow with ancillary equipment connected to milking added, machine in the milking position (liners plugged), test at A2 and Vr or Vp _____ l/min
 Milking system ancillary equipment usage (5-6) _____ l/min
 7. Airflow with pulsators added; machine in the milking position (liners plugged), test at A2 and Vr or Vp _____ l/min
 Pulsation usage (6-7) _____ l/min
 8. Airflow with ancillary equipment connected to airline added; machine in the milking position (liners plugged), test at A2 and Vr or Vp _____ l/min
 Airline ancillary equipment usage (7-8) _____ l/min
 9. Manual reserve; machine in the milking position (liners plugged) _____ l/min

Rate c/min _____ Max _____ Min _____
 "b" phase vacuum kPa Max _____ Min _____
 Ratio "a+b" % or ms Max _____ Min _____
 "a" value % or ms Max _____ Min _____
 "b" value % or ms Max _____ Min _____
 "c" value % or ms Max _____ Min _____
 "d" value % or ms Max _____ Min _____

Pulsation printout attached: yes/no _____
 Simultaneous or Alternate _____
 Limping (< 5%) _____

Liners
 Make and identification no. _____
 Calculate date of next liner change _____

N.B. Items in Bold Type must always be filled in. Complete tests 9 and 10 or test 13 units. Test 13 does not measure regulation loss or regulator leakage. Check "b" phase vacuum levels on the pulsation graphs. It is recommended that milking machines be tested at least twice per year.
 IMQCS - www.milkquality.ie

Liner change interval (example)

- 16 units
- 128 cows
- 8 rows
- 2 milkings/day
- Each liner milks 16 times per day
- $2000/16 = 125$ days is the liner change interval

machine in the milking position _____ l/min
 or Vp _____ l/min

17. Airflow with regulator(s); machine in the milking position (liners plugged), add regulator(s), drop vacuum 2kPa below 1a, test at A1 and Vr _____ l/min
 Regulator leakage (16-17) _____ l/min

Faults

Min _____
 Min _____
 Min _____
 Min _____
 Min _____
 Min _____

Recommendations

in. Complete tests 9 and 10 or test 13. The result of 13 may be difficult to interpret for milking machines with less than 14 or regulator leakage. Check "b" phase and "d" phase vacuum levels on the pulsation graphs. Tested at least twice per year.

Revision 2.

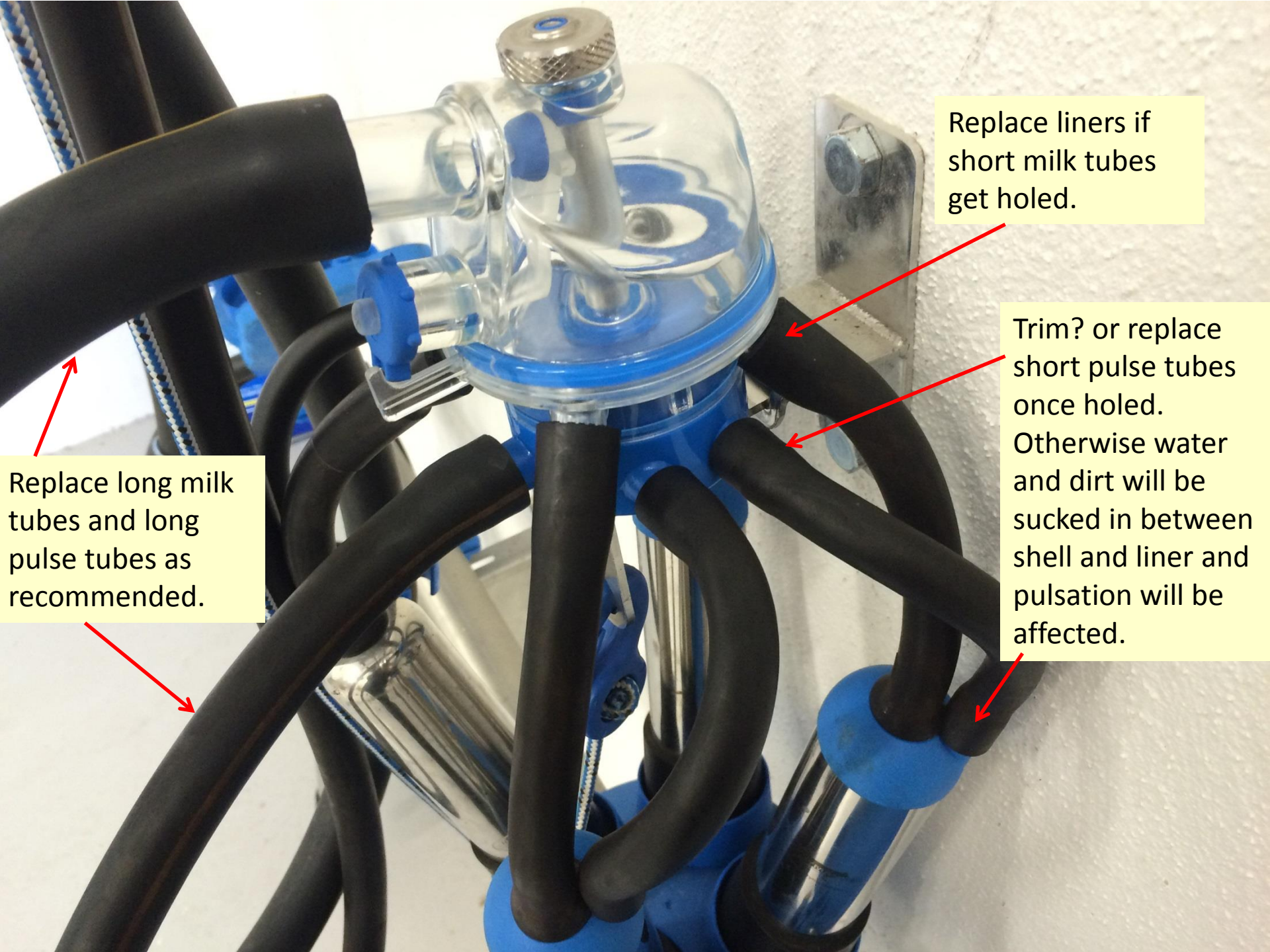
AFM for testing claw air admission, cluster and shut-off valve air leaks

Air admission hole sealed off – no cluster leaks here.
Leakage limit of 2lit/min

Air admission hole open – claw air admission is 7 lit/min

Checking shut-off valve – perfect seal

Dipping bowel in bucket of water would also show up leaks



Replace liners if short milk tubes get holed.

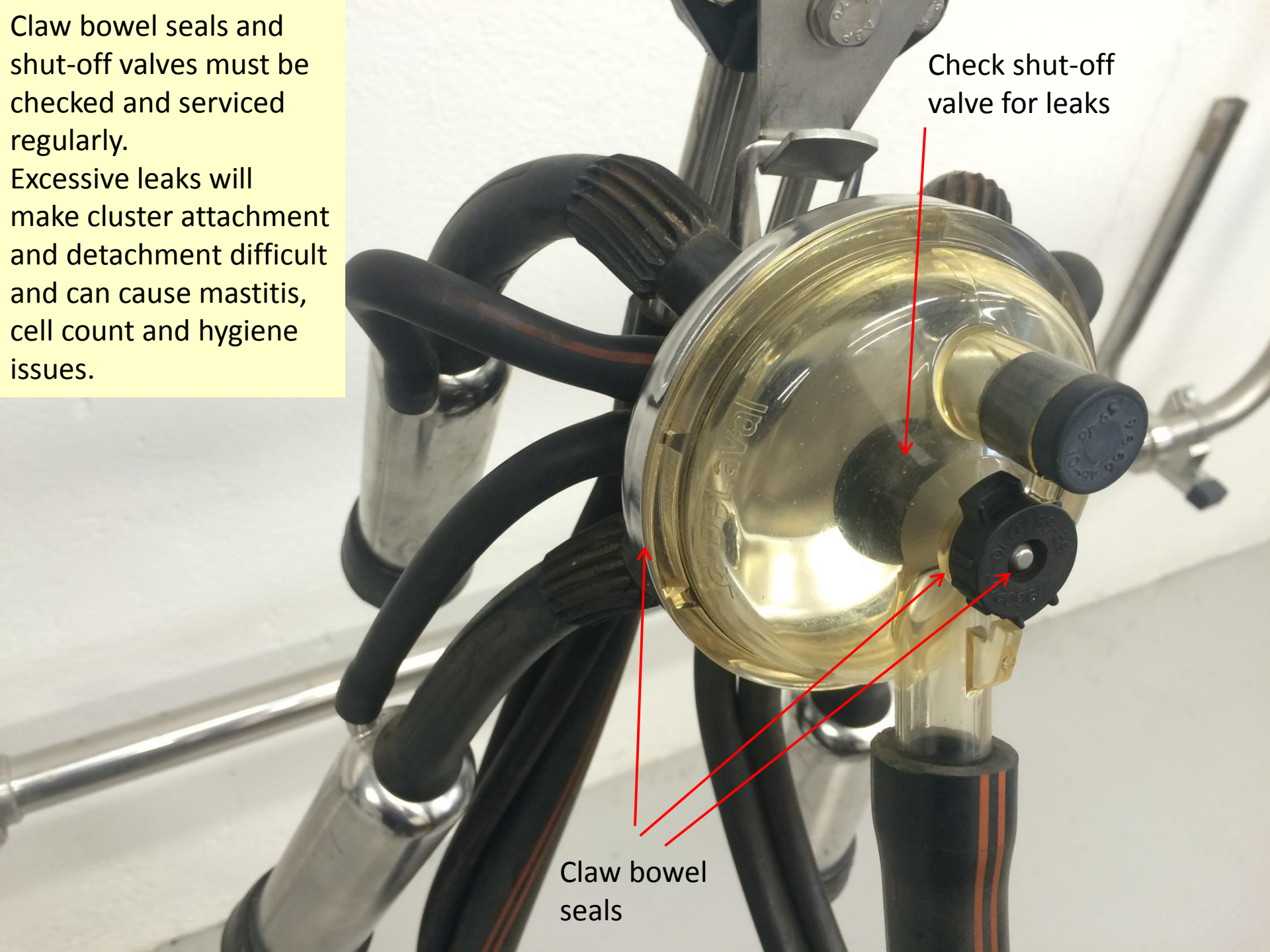
Trim? or replace short pulse tubes once holed. Otherwise water and dirt will be sucked in between shell and liner and pulsation will be affected.

Replace long milk tubes and long pulse tubes as recommended.

Claw bowel seals and shut-off valves must be checked and serviced regularly. Excessive leaks will make cluster attachment and detachment difficult and can cause mastitis, cell count and hygiene issues.

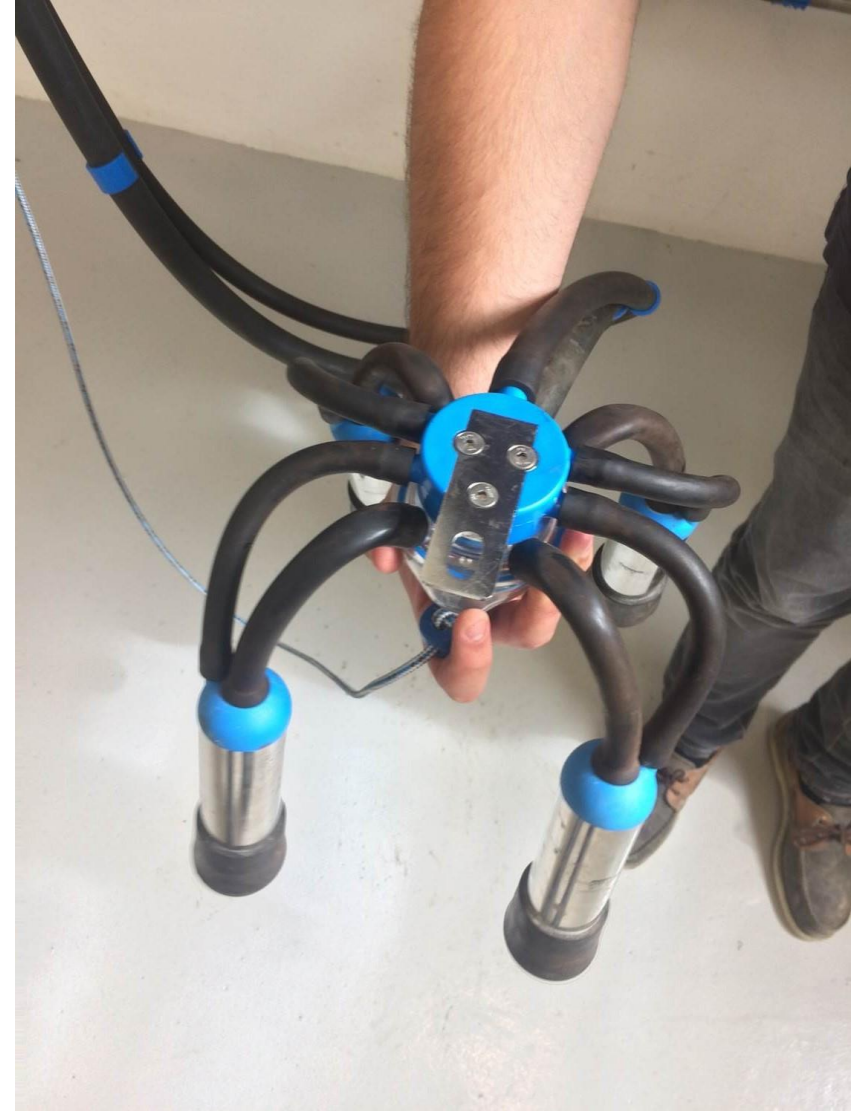
Check shut-off
valve for leaks

Claw bowel
seals



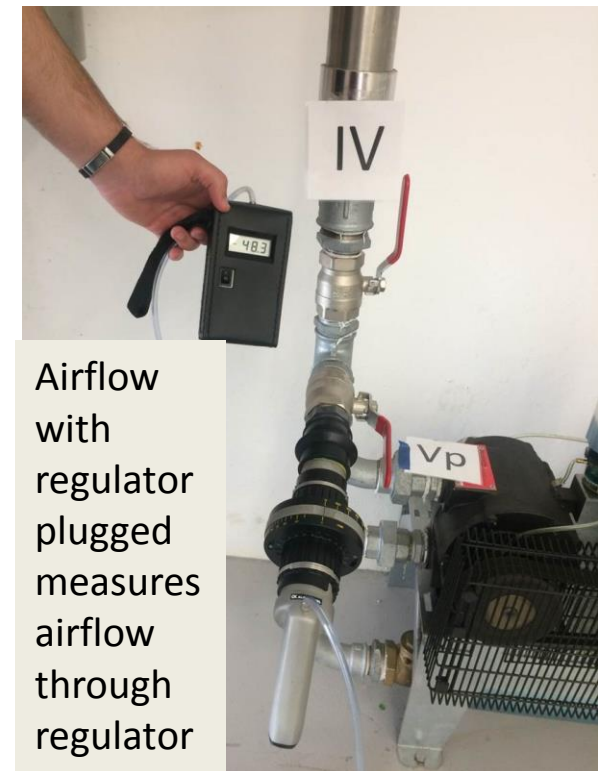
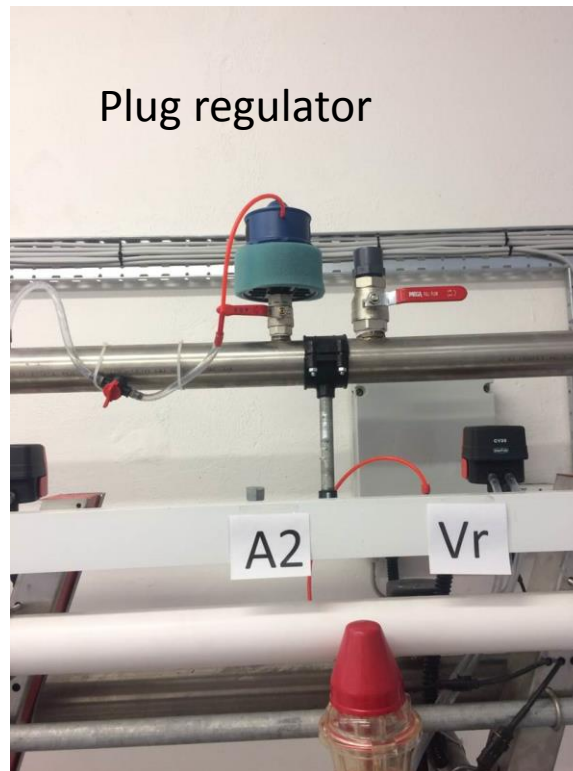
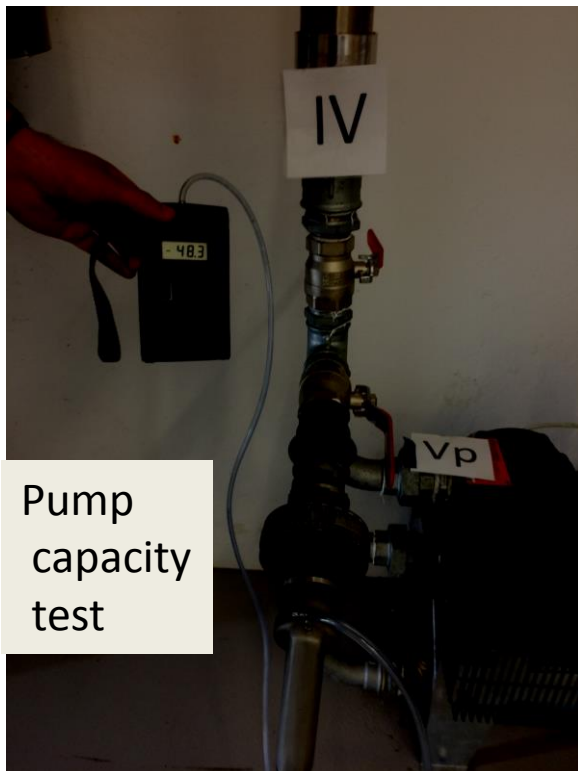
Set-up cluster properly

- Careful liner refitting is important
- Short milk tubes pushed fully home
- Short pulse tubes correct length and pushed on well
- Line up short milk tubes and short pulse tubes properly when fitting
- Easier attachment and detachment
- Requirement to limit airflow through cluster until attachment
- Liners not twisted in their shells
- Have spare liners and box of short pulse tubes
- Check for claw nipple damage when changing liners



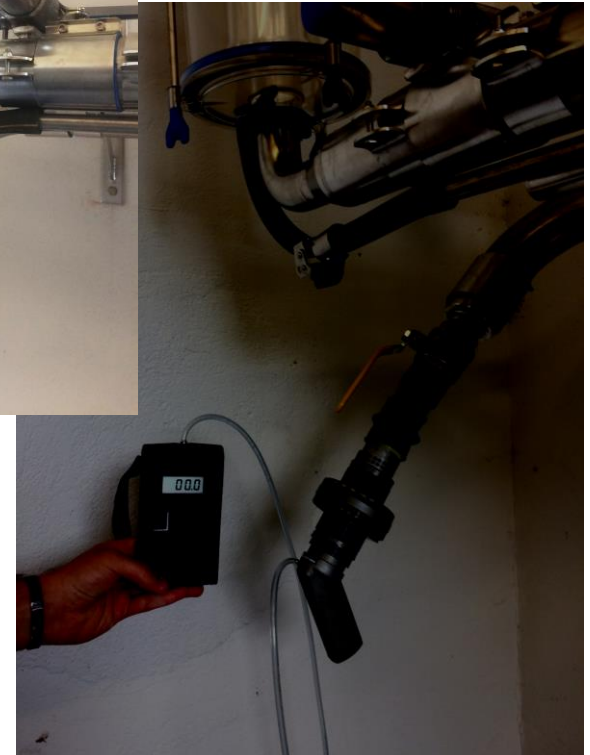
Test for overall airflow usage and leakage

- Non-standard test
- Measure working vacuum at V_p
- Measure pump capacity (l/min)
- Plug regulator(s)
- Close in AFM to bring vacuum level back to working vacuum at V_p
- Read AFM l/min
- Overall usage is difference between the two readings. Divide by no. of units to get usage per unit – typically 40 to 65 l/min



Large bore lever valve at end of airline

- Large bore nipple and lever valve at end of airline is very useful for washing the airline
- Dipping a large bore suction tube in and out of wash solution can simulate slug washing
- A large drop in reserve if measured at end of the airline indicates a blockage somewhere downstream





The wash drain tube valve between the sanitary trap and the milk receiver must be closed during milking, otherwise drain-back, if any, will affect TBC.

Fall in main airline should be towards interceptor or other drain valve

Breather lines

- Clean/replace filters as required
- Check breather tube connection to relays
- No filters on some original installations
- Birds, vermin or water can get in if no filters
- Filters reduce noise

