LT4 Series

In-Machine Leak Detectors - Practical Considerations

PLASTECH CONTROL SYSTEMS

Overview

Plastech Control Systems have many years experience in this area of leak detection. This document outlines the advantages, and the pitfalls, of "In-Machine" leak detection. Plastech supply both in-machine and conventional external solutions; customers should consider the trade-offs carefully when choosing between them.

In-machine leak testing is normally done immediately after the deflash station. The existing grippers that carry the bottles to the deflash station can be extended (if required) so that they place the bottles under the leak tester heads. The bottles are then tested during the next machine cycle.

Advantages

"In-machine" leak detection has some advantages compared to conventional "In-line" testing on an external conveyor:

- Bottles are securely placed and held under the test heads by the machine grippers.
- Bottles are tested on a stable platform rather than on a moving conveyor.
- There is usually a longer available test time.
- Bottle queuing and handling problems around the leak tester are eliminated.

Pitfalls

In our experience there are several associated pitfalls that *must* be addressed if the overall system is not to be a disaster!

- **Bottle Temperature.**

  The high bottle temperature may reverse the gains in sensitivity expected from having a longer test time. This aspect is mostly compensated for in Plastech leak testers.

- **Maintenance**

  There are minor operations that are trivial with an external leak tester (replacing test head seals, adjusting test heads, leak tester verification with "test bottles"). These result in a blow moulding machine stoppage for an in-machine unit.

- **Safety**

  The impact on both machine and operator safety needs to be assessed. For example, operation of the takeout mechanism with the test heads down may need to be interlocked. If the takeout grippers are extended, this may mean that the machine guarding needs to be extended too, to prevent operators touching the extended grippers.

- **Bottle Rejection**

  The greatest potential problem is unreliable bottle rejection.

  From time to time a blow moulding machine will have periods when it generates a large percentage of scrap bottles. The defects can vary from simple small holes, to totally malformed bottles that are just scraps of plastic. During these periods the bottles can come out all stuck together, squashed up etc.

  In general, it is not possible to design a perfect in-machine "reject" mechanism that is *guaranteed* to cope with everything that is thrown at it.

  The most reliable type is a "trap door" immediately under the bottles being tested. It is reliable because it does not rely so much on bottles being correctly transported past a reject station. Unfortunately this can be mechanically very complicated to arrange, especially if bottles are to be individually rejected (rather than losing all the bottles if a single one fails).

  The alternative is to wait for the bottles to come out of the test station, and reject faulty ones as they emerge.

  This is a dangerous strategy.

  For example, consider a 5 head leak tester. One or more bottles might not make it to the test station (perhaps it was not blown properly and fell off the blowpin). The leak tester will show a reject for the missing bottle. When the other four bottles are pushed past the reject station, the missing bottle can cause the rejection to be "out by one" (on a naive implementation) If another bottle is present and has a leak, the wrong bottle will be rejected and the leaker will not be.

  We have implemented systems to compensate for this; for example we can detect which test stations do not have bottles and allow for this when deciding which bottle to reject at the reject station.

  However, our experience is that one day there will always be a sufficiently bad machine problem that will overwhelm any clever scheme we can come up with! When a bottle jam occurs within a blow moulding machine, the operator is typically only concerned with clearing the jam as quickly as possible to minimise machine stoppage. He does not have time to simultaneously ensure that none of the bottles involved made it onto the conveyor.

  Conveyor fed leak testers do not suffer so much from this; most bottles that make it all the way down the conveyor are separated, distinct and have cooled down. Clearance of blow moulding machine jams has no effect on a leak tester that is several metres downstream. If the operator accidentally lets a deformed bottle onto the conveyor, a downstream leak tester will not let it through.

Conclusion

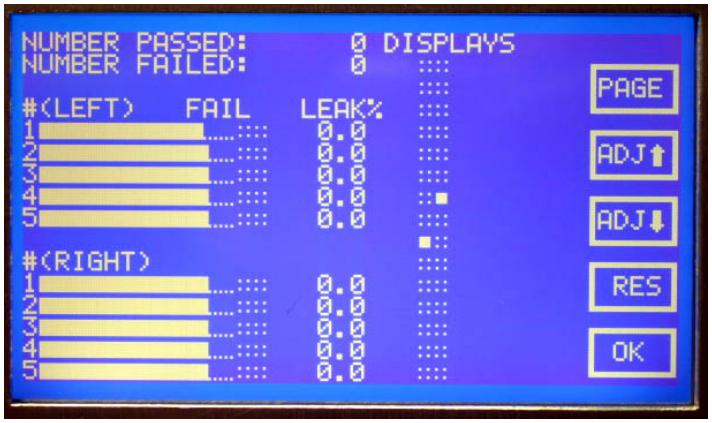
If bottle jams in the reject area never, or very rarely, happen then the other difficulties can be worked around by suitable design. This is often the case for low-speed machines.

If the machine does occasionally jam, the operator *must* not allow through any bottles involved since these could be rejects.

Some blow moulding machines can have times where they make mostly scrap, for example during periods of startup, machine problems or severe material contamination. In these situations, an in-machine leak tester should not be used as a way to mechanically separate the few good bottles with perfect reliability. Unfortunately, these situations do seem to happen in practice far more often than were initially envisaged!

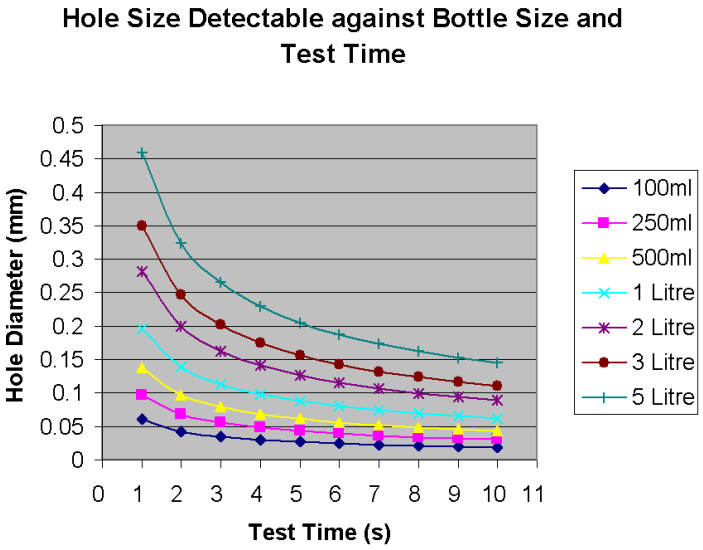
Plastech In-Machine Leak Detectors

If the customer requires an in-machine solution, we recommend our LT4 range. These have been specifically designed for in-machine use.



10 Channel Leak Tester for Twin Sided Machine

An LT4 can be fitted to single or twin sided machines and is available with up to 24 channels of operation (test heads). A single touch-screen control panel can control both sides of a double sided machine. Separate boxes, local to the test head assemblies, contain the pneumatic controls. This minimises pneumatic piping and improves accuracy.



Ordering

The LT4 part numbering scheme is

LT4-X-Y-Z where

X = Number of Sides = 1 or 2,

Y = Number of Heads per Side = 1 to 12,

Z = Power Supply = 24VDC, 24VAC, 120VAC, 230VAC.

For example, a twin sided machine with 5 heads each side (10 heads total) powered from the blow moulding machines 24V supply would be ordered as:

LT4-2-5-24VDC

Specification

Hole Size Detected	0.1mm / 1 Litre / 2 seconds. See performance Graph for details.
Number of Test Channels	1-24, single or twin sided (Specify when ordering)
Leak Test Method	Ratiometric Pressure Decay, Auto-zero, Auto-Scale. Adaptive pressurisation algorithm.
Power Supply	24V AC/DC or 110/120 or 220/240 VAC, 50-60 Hz (specify when ordering)
Power Consumption	50 VA maximum
Air Supply	60-150 psi (4-10 bar)
Air Consumption	1 litre per minute typical
Minimum Bottle Volume	100 cc
Maximum Bottle Volume	10 litres (2 gallons)
Test Pressure	Adjustable, 0.15 - 0.6 psi (10 - 40 mB)
Cycle Time	1.0 - 20.0 seconds
Transducer	Semiconductor strain gauge diaphragm, 0.00 - 100.00 mB, 0.002% resolution, x20 Over-pressure Protection.

For more details contact the office, our distributors or see our web site www.plastech-controls.com, where you can obtain on-line sales literature, complete user manuals and technical documentation.

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