
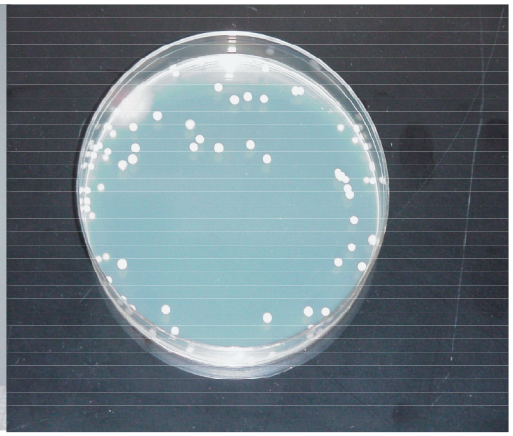

TECH TIPS

Issue #4 January 2006

RCS Air Testing Guidelines

One of the many services JohnsonDiversey provides for its customers is the Quality Insurance Program or QIP. This program serves to provide a snapshot of the processing environment of the customer's plant and its potential to affect the product during manufacture. A key element of this environmental assessment is the use of the RCS (Reuter Centrifugal Sampler) Air Sampler to determine the quality of the air in the facility.

Microorganisms can travel through a plant in a number of ways. They can be carried on dust particles, carried inside aerosol droplets from splashing water, or as part of their normal reproductive cycle, e.g. mold spores. This gives us some hints as to where to concentrate our investigative efforts to track down the source of airborne contamination.

Surveying the Area

The first thing we need to assess is the potential impact on the product itself at all locations where it might be exposed to the air in the plant, particularly after whatever heat treatment is used on the product. Bulk storage tanks and filling systems are the most likely areas where the product may be exposed to the air, and samples should be taken at these locations first.

The next step is to observe the surrounding area to see what might be affecting the air near the exposed product. There are two ways that air at the product surface may contain microorganisms. It may already be contaminated as it comes from the HVAC (Heating Ventilation Air Conditioning) system itself, or microorganisms can become entrained in the clean air as it passes over dirty surfaces or aerosol sources.

Are there any HVAC diffusers providing positive air to the room? If so, use a ladder and take a sample directly at the point of air introduction to the area. Are there any other sources of air into the room? Doorways, open or otherwise, should be checked to determine the direction of air flow, as should any other openings such as those for piping or conveyors. If the air flow is toward the room under investigation then a sample should be taken next to the opening as well as from the area on the other side of the wall for comparison. Be sure to consider activities that can affect the direction of airflow such as bay doors being open instead of being closed. Are there any fans or other air handling devices such as blast coolers that might affect air flow during operation? During one recent investigation it was discovered that the positive pressure in the filling room was sufficient to ensure that air was moving from the filling area into the palletizing room during normal operation. However, positive pressure in the filling room was not maintained when the operators in the palletizing room turned off the warehouse blast cooler in their area. Because the product was already packaged at this point, the palletizing area was on a more relaxed environmental sanitation program, as evidenced by the visible mold growth on the walls. A recent increase in mold complaints had prompted the investigation in the first place. Once the palletizing area was cleaned and provisions put in place to maintain proper air flow, the mold complaints were reduced to nearly zero.

Are there any other likely sources where microorganisms might be picked up by clean air in the room? Look for areas such as condensate drip pans, drain lines from drip pans, conveyors, stackers, trash compactors, and drains. Look for activities like hose usage, traffic through standing water, spilled product, etc. Any activity involving water can be a source of airborne contamination. Violent splashing of water is obviously creating aerosols, but they can be created by much less vigorous activity. For example, the vortex created at a drain can produce significant aerosols, as can condensate dripping from overhead piping.

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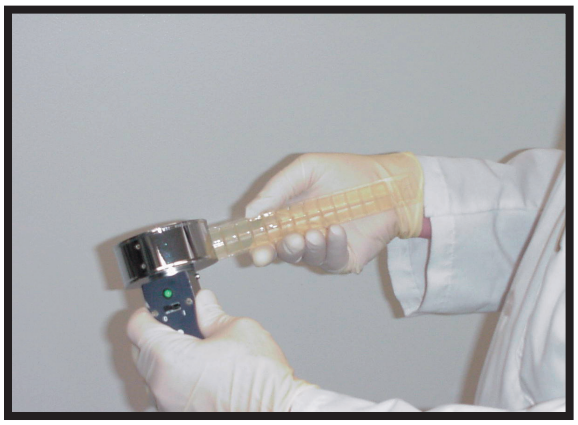
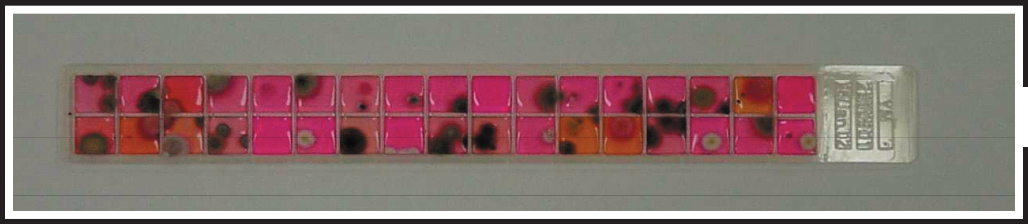
RCS Air Testing Guidelines



Inserting the Air Strip into the RCS Air Sampler

Testing

Many plants still use settling plates to assess air quality. This method involves exposing pre-poured Petri plates to the air for usually 15 minutes. The plates are then covered, incubated, and counted with the results expressed as cfu (colony forming units)/plate. This method is not especially good at absolute quantification of the microorganisms in the air as it relies on the settling rate of the particles which can be affected by air currents, etc. For this reason it is not useful for comparing different locations, but it is very useful to compare results from the same location at different times. A spike in the results for a particular location should trigger corrective action for that location. It can be useful to take RCS samples at the same time as the customer's own use of settling plates as a means of "calibrating" the settling plate method for a particular location. The absolute numbers will not necessarily correlate well but the pass/fail criteria used by the plant should give the same assessment as the pass/fail targets used to interpret the RCS results, i.e. both methods should agree that the air in that location was acceptable or not acceptable.



The airstrip after incubation

The RCS Biotest sampler works by using centrifugal force and a specially-made agar strip. Air is pulled through the open face at a fixed rate by an impeller then spun around causing suspended particles to collide onto a strip of agar media. The media strip is then incubated and counted. Since the sampling rate is a fixed volume (40 L per minute) the counts on the strip can be multiplied by a factor based on the sampling time used to quantitatively assess the microbiological quality of the air:

$$\frac{1000}{\text{sampling time in minutes} \times 40} = \text{factor}$$

colonies per strip x factor = cfu/m^3
Target for total bacteria <250 cfu/ m^3
Target for Yeast and Mold <100 cfu/ m^3

The Sampling Times can be Adjusted

The investigator's sampling protocol is crucial in the ultimate reliability of the results. These protocols include calibration of the RCS Air Sampler (which is done by JohnsonDiversey Microbiological Services in Sharonville), practicing aseptic technique, properly packaging samples for shipment to the laboratory, and accurately filling out the QIP paperwork. Aseptic technique means employing practices that help minimize the chance of contaminating the sample with microbes from sources other than from the test source. Contaminants may be introduced from the environment, equipment, supplies, previous samples, and personnel. Wiping down sampling equipment with alcohol pads is effective in reducing cross-contamination through equipment.

The guarantee of food quality, and particularly food safety, is the responsibility of all food processors. This responsibility is not only for the quality of the end product, but also the precautions which must be taken in the preparation and processing of foods to minimize the risk of contamination. This includes not only the processing equipment, but also the processing environment, including the air, which may reduce product shelf life or pose a hazard to food safety. While air filtration is now standard practice in many food processing environments, significant increases in airborne microbial counts may occur as a result of failure to adhere to Good Manufacturing Practices or failure of the air filtration system due to design, inadequate maintenance, malfunction, etc. Frequent and effective monitoring of the microbiological quality of the air in the process environment is essential to alert processors of the potential risks, and the possible need for corrective action.

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