CIMCOOL FLUID TECHNOLOGY

EFFECTIVE BIOLOGICAL CONTROL

March 22, 2011

Biological control is essential in maintaining a pleasant, odor-free work environment. An effective biological control program includes a good initial system cleanout and disinfection, using the fluid within the recommended dilution range, and thorough diagnostic evaluation and monitoring. Finally, an effective treatment plan to prevent potential problems associated with microbial growth is essential.

(NOTE: Pictures contained in this *TECH TALK* are intended for internal use only)

TYPICAL METALWORKING FLUID ORGANISMS

BACTERIA: Produce rancid odors described as "garbage," "gym shoe," "sewer," or "rotten egg" smells. Combi-Sticks or plate cultures are effective measurement tools, unless tramp oil is present. Tramp oil may coat the combi-stick preventing a good culture from being obtained. GROTAN™ (1:1500) is effective for treating bacteria. An "M-time" of 60 seconds or less is generally an effective control method. (Do not add GROTAN or other alkaline materials unless an "ammonia-release" test is completed). BUSAN™ 77 is used for cationic products only. KATHON™ 886MW at 1:8000 is effective, but may be hindered by the presence of mold.

GRAM NEGATIVE BACTERIA

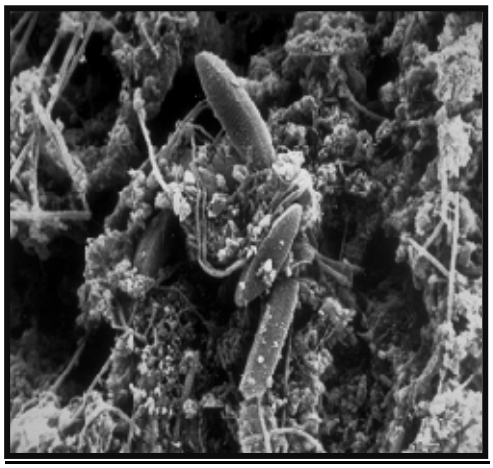
MOLD/FUNGI: Produce ammonia, "musty", "stale" odors. Combi-Sticks or plate cultures can give **"False Negatives."** A "no-count" reading on a Combi-Stick should **NOT** be interpreted that there is no mold present. Mold can be cultured from the used fluid, but it more often grows in and around machinery, on the sides of fluid troughs, stagnant spots, on grating, splash areas, or areas other than in the coolant. A positive mold reading at **ANY** level on a Combi-Stick or plate count should be considered as a serious problem.

BUSAN 30WB at a 1:10,000 dilution is an effective fungicide. SODIUM OMADINE and KATHON 893 may give good results in some situations, but are negatively affected by the presence of tramp oil. For individual machines, TRIADINE™ 20 can also be used to control bacteria and mold.

MYCOBACTERIA are also known as Acid-Fast Bacilli due to a unique cell wall that contains mycolic acid. The thick mycolic acid cell wall makes Mycobacteria more resistant to biocides than regular bacteria. Mycobacteria are "environmental" organisms, commonly found in soil and water. Mycobacteria species have been associated with Hypersensitivity Pneumonitis (HP). HP has occurred in workplaces where mycobacteria were not present. The medical consensus is that HP has a "biological" origin, and experts are considering all possible causes including mold, bacteria, mycobacteria, and possibly other organisms that are unknown to us at this time. It is prudent to consider all possible causes. Several approaches to eliminate mycobacteria are being evaluated, including the use of Kathon™ LX5000 at 1:4000. There is still no conclusive evidence as to the definitive cause of HP.

BIOFILMS are organic polymer matrices of microbes, hard-water scum (Calcium/Magnesium are essential for biofilm formation), oils, and frequently metal fines. The microbes may include mold, bacteria, and algae. Biofilm removal may be very difficult, since it is frequently attached to system surfaces. In those systems that will tolerate foam such as high tramp oil systems, CIMCLEAN® 30 at 1% dilutions can be an option. Keep in mind that CIMCLEAN® 30 is alkaline. Care should be taken to ensure that an ammonia release ("bloom") does not occur, and that foaming will not be a problem. KATHON 893 has also been shown to inhibit biofilm attachment, but is not effective in systems with tramp oil. Physical removal is essential to eliminate biofilms.

MICROSCOPIC VIEW OF BIOFILM ON AIR CONDENSOR



PLANT HYGIENE RESPONSIBILITIES:

A good biological control program includes plant hygiene practices that focus on **PREVENTION** through maintenance. Fluid system cleanings conducted on a routine basis can be very effective in inhibiting mold and bacteria growth. Removal of tramp oil, chip-dams, and shop debris help eliminate conditions that promote microbial growth.

The removal and prevention of mold growth are important plant hygiene functions. While fungicides are effective in treating molds in active metalworking fluids, fungicides must come into direct contact with mold growths. Mold masses growing in splash areas, on grating and under machinery will not have sufficient contact with fungicides. Therefore, physical removal of mold infestation areas may be necessary.

It is recommended that the plant maintenance personnel clean all machinery on a daily basis, using the metalworking fluid as the cleaning fluid. Care should be taken to spray all stagnant areas in and around machines, "dead-hole" spaces, troughs, and grates. The metalworking fluid can be treated to contain the correct concentration of fungicide and bactericide. This daily cleaning will improve plant aesthetics, and make it much more difficult for microbes to establish and sustain growth.

Other factors in good plant hygiene practices include proper fresh-air exchange rates for metalworking operations, reducing mist generation through shielding or mist collectors, and proper maintenance of HVAC duct work, filters and oil mist collectors. Ducts and mist collectors probably will contain the same organisms found in the metalworking fluid systems and other airborne species in the ambient environment. Drainage collected from oil skimmers or mist collectors should **NEVER** be put back into the metalworking fluid system. The plant maintenance workers need to be notified of their roles in controlling microbial growth. Offer technical assistance whenever needed to aid in this effort.

MICROSCOPIC VIEW OF DUST MITE IN HVAC DUCTWORK

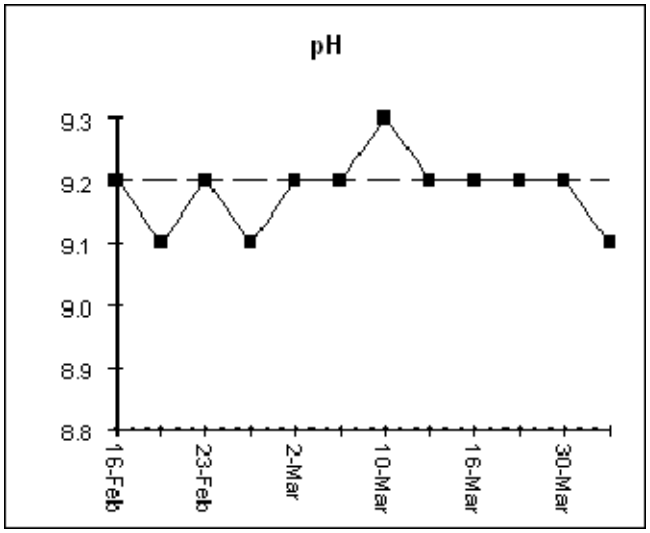
System recharges should include the cleaning of trenches, reservoirs and system walls with CIMCLEAN 30 or CIMCLEAN 40, depending on whether the system is for ferrous or non-ferrous metals. A day or two prior to recharging, a 1% solution of these cleaners can be added to the system and circulated. During system cleaning, a 2% solution should be circulated for at least 6 hours, and then thoroughly rinsed to avoid recharge contamination. (Refer to product literature or "*SYSTEM CLEAN-OUT TECH TALK*" for detailed procedures.)

On-going preventive maintenance should include the daily wash-down of machines, trenches and work areas as described earlier.

DIAGNOSTIC TOOLS:

Concentration: Care should always be taken to maintain the system at or above the minimum recommended concentration range. In most cases, this is a 5% concentration. CIMCOOL® products are formulated to perform best at this range. Metalworking fluids that run at leaner concentrations than recommended create growth opportunities for microbes.

pH: Even low bacteria levels, if left untreated, can cause a drop in pH, due to their production of acidic waste compounds. Bacteria can cause pH to decrease below 8.5, and can result in the fluid actually becoming acidic or "splitting" in the case of a soluble oil or semi-synthetic. A pH drop due to mold proliferation will be subtler than from bacteria. If the pH is at 8.7 or above, you should consider that mold contamination is the organism. If the pH is below 8.6, you likely have bacteria, OR there may be both bacteria AND mold. Maintaining the pH within the correct product concentration ranges will aid in preventing microbial growth.



D.O.: A decrease in Dissolved Oxygen readings is considered to be an "early warning" of microbial activity. When considered in conjunction with pH readings, D.O. measurements can be a very valuable tool. As microorganisms grow and replicate, they consume Oxygen, as a result of metabolic requirements. A previous bulletin on Interpreting D.O. Readings has been issued. D.O., pH, and visual inspections (including odor observations) are very valuable diagnostic tools for identifying and preventing microbial growth. Where D.O. drops in the absence of bacteria counts (combi-stick or plate culture), there is a strong indication of the presence of mold, even in the absence of mold growth on combi-stick or plate culture techniques.

Visual Inspection: During the service visit, physical inspection of the metalworking systems should be conducted. Areas of potential mold growth (see above) should be visually observed, and any suspected areas of mold growth should be reported immediately to the plant management. Inspection in and around machinery, on the sides of fluid troughs, stagnant spots, grating, splash areas, and other similar areas should be observed and noted.

HEALTH & SAFETY

Besides aesthetic problems within manufacturing plants uncontrolled microbial growth has been implicated in sensory irritation and HP. Ammonia releases can create uncomfortable working conditions, especially for those with asthma or other similar breathing impairments. Because of the sensory problems experienced in the presence of ammonia, workers will usually become uncomfortable and leave affected areas before hazardous levels are reached.

Endotoxins (cell wall-associated lipopolysaccharides from gram-negative bacteria) have been associated with flu-like symptoms in susceptible individuals. Controlling bacteria to low levels and treating bacteria growth with GROTAN are believed to reduce potential problems from endotoxins.

Environmental factors affect workers as well. During certain times of the year, and especially rainy seasons, air-born mold counts can reach very high levels. Not only can mold spore and pollen counts affect the health of sensitive individuals, higher levels create more control problems for metalworking fluid systems. Wind-blown dust during harvest season for example, can be a temporary source of contamination in nearby manufacturing plants' metalworking fluid systems.