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Analysis carried out by

Research Center Weihenstephan

for Brewing and Food Quality

Flexelene™ Silver Tubing

Denver, Colorado – August 8, 2012 – Eldon James Corporation – a leading, U.S. based manufacturer of plastic tubing and fittings – announced the successful results of tests intended to determine the antimicrobial activity of Flexelene™ Silver Tubing against beer spoiling microorganisms involved in the formation of biofilms in the brewing environment. While the news of these results is expected to have a significant impact on the beer and brewing industry, the positive results also have noteworthy implications on the food and beverage industry as a whole. The testing was conducted by the Research Center Weihenstephan for Brewing and Food Technology (Forschungszentrum Weihenstephan), the world's leading specialists for analysis and research on topics related to beer and food.

Eldon James Corporation is an ISO Class 8 cleanroom, ISO 9001 and ISO 13485 certified facility located in the United States in Colorado specializing in the manufacture of low extractable tubing and hose connectors used in medical device, laboratory, pharmaceutical and the beverage industry.

Eldon James also manufactures antimicrobial tubing and fittings that inhibit the growth of bacteria, molds, fungi and other microbes through the release of silver (Ag) ions.

Eldon James contracted the Research Center Weihenstephan for Brewing and Food Technology (Forschungszentrum Weihenstephan) of the Technische Universität München, Germany to determine the antimicrobial activity of Flexelene™ Silver Tubing against beer spoiling microorganisms involved in the formation of biofilms in the brewing environment and to test the influence of rubber material Flexelene™ Silver Tubing to smell and taste on beer and alcohol.

In the brewing environment, there are a few microorganisms capable of growing in and deteriorating beer. In addition to these obligate beer spoilers, there are some bacteria, yeasts and molds socialized in biofilms together with the beer spoiling bacteria whose detection give an insight to the hygiene conditions of the brewery. Biofilms grow on equipment components and in niches that are difficult to clean. They get in touch with the product and provide ideal growth conditions for a multitude of germs. For example once colonized in the filler surrounding, these germs can get consistently into the product and cause damage („Streukontamination"). That's why particular attention should be paid to bacteria and yeasts that take part on the formation of biofilms [1].

For testing the antimicrobial coating of Flexelene™ Silver Tubing, four industry isolates were chosen that take part on the biofilm formation. Below is reported which impact the particular microorganisms have on beer:

→ ***Acetobacter lovaniensis****: This acetic acid bacterium is a gram-negative, katalase-positive rod that occurs in early stages of biofilm formation. In wort and beer with high oxygen content, acetic acid bacteria can proliferate and cause an acidic off-flavour [1].*

→ ***Wickerhamomyces anomalus****: W. anomalus (formerly: Pichia anomala) is widespread among many production steps of alcoholic beverages. It belongs to the group of slow fermenting yeasts and is in carbonated beverages responsible for solvent-like off-flavours [2-4]. W. anomalus was detected in many cases in the brewing environment and its participation in biofilm formation was confirmed [5].*

→ ***Lactobacillus brevis****: This gram-positive, katalase-negative rod is facultative to strict anaerobic. It is by far the most frequently detected microorganism in beer [6, 7]. Lb. brevis is classified as obligate beer spoiler, i.e. it tolerates all selective characteristics of beer and deteriorates it by haze, acid formation and off-flavours. According to BACK, yeasts and lactic acid bacteria take part in later stages of the biofilm formation (step 3) [1].*

→ ***Pseudomonas aeruginosa****: Ps. aeruginosa is a gram-negative, aerobe rod that can cause inflammations and infections. It ends up in the brewing environment by the water, especially, and takes part on biofilm formation as slime-forming bacterium [1, 6]. The absence of this bacteria species is obligatory for bottled water, e. g. bottled mineral water.*

To avoid the formation of biofilms and microorganism aggregations by regular and thorough cleaning is one of the main tasks of breweries and gastronomy.

Strains of the genera Acetobacter, Wickerhamomyces, Lactobacillus and Pseudomonas can also occur as biofilm colonizers and potential spoilage organisms in other beverage industries as e. g. in the wine industry.

The antimicrobial coating of Flexelene™ Silver Tubing had an effect on all the tested microorganisms. The test results confirm that the Flexelene™ Silver Tubing is capable of reducing the concentration of all the selected biofilm microorganisms up to 100.0 % over the 24 hours test period.

The influence of rubber material to smell and taste was analyzed acc. to MEBAK IV, 2nd edition, issue 1998, „4.6 influence of rubber materials to smell and taste". There is no significant difference between the „treated" and blank sample.

Because of the potential increase in quality assurance and the implications of reducing costs of production and downtime, Eldon James' Flexelene™ Silver tubing is now expected to have a significant impact on the food and beverage industry. Long-term tests with regards to the effect of Silver (Ag) Ions in Flexelene™ Silver Tubing are currently in preparation.

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