

NBB® – Fast, reliable and selective detection of all beer spoiling microorganisms



Production process

| Process | Samples | Method/Sample size | Sampling frequency | NBB format | Culture vessel | Incubation days | Condition | Analysis | Detectable microorganism – most important species |
|---|--|---|--|------------|--|-----------------|--|---|---|
| Water supply | Well water before / after filtration and preparation City water | Membrane filtration 100 ml | Occasionally Identify source of contamination | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | <i>Lactobacilli, variety of species; Lactococcus lactis; Enterobacter; Klebsiella and others</i> |
| Cold store (Wort way) | Wort samples | Liquid enrichment: 30 ml Wort + 100 ml sterile beer + 40 ml water | Occasionally Identify source of contamination | NBB®-C | 180 ml Swing stopper sample bottle or alternative bottle | 5-7 | anaerobic condition by completely filled bottles | Turbidity Sediment | <i>Lactobacilli, variety of species; Pediococci; Lactococcus lactis; Enterobacter and others</i> |
| | Rinse water samples from wort processing until starting vessel / Cooling water; coolant | Membrane filtration 50 - 100 ml | | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | |
| Yeast propagation Yeast cellar | Yeast samples Pure culture / Pitching yeast / Cropping yeast / Tank sediment | Liquid enrichment of 0,5 - 1 ml | Regular during production | NBB®-B | Test tubes with about 15 ml NBB®-B | 2-5 | anaerobic condition by initial yeast CO ₂ forming | Indicator change ² Analysis by microscope | <i>Pediococcus damnosus; Lactobacillus lindneri; Lactobacillus brevis; Lactobacillus backii; Lactococcus lactis; Enterobacter and others; Pantoea agglomerans</i> |
| Fermenting room | Green beer Yeast containing | Liquid enrichment of 100 - 120 ml + approx. 50 ml water | Regular during production | NBB®-C | 180 ml Swing stopper sample bottle or alternative bottle | 7 | anaerobic condition by completely filled bottles | Turbidity Sediment | <i>Pediococcus damnosus; Lactobacillus lindneri; Lactobacillus brevis; Lactobacillus backii; Lactobacillus casei</i> |
| | Yeast sediment | Liquid enrichment of 0,5 - 1 ml | | NBB®-B | Test tubes with about 15 ml NBB®-B | 2-5 | anaerobic condition by initial yeast CO ₂ forming | Indicator change ² Analysis by microscope | |
| Storage cellar | Sampling tap Yeast containing Sampling tap + 5 - 10 ml tank sediment | Liquid enrichment of 100 - 120 ml + 50 ml water | Weekly / biweekly / occasionally | NBB®-C | 180 ml Swing stopper sample bottle or alternative bottle | 7 | anaerobic condition by completely filled bottles | Turbidity Sediment | <i>Lactobacillus lindneri; Lactobacillus brevis; Pediococcus damnosus; Lactobacillus backii; Lactobacillus casei</i> |
| | Tank sediment | Liquid enrichment of 0,5 - 1 ml | Before filtration / occasionally | NBB®-B | Test tubes with about 15 ml NBB®-B | 3-5 | anaerobic condition by initial yeast CO ₂ forming | Indicator change ² Analysis by microscope | <i>Pediococcus damnosus; Lactobacillus lindneri; Lactobacillus brevis; Lactobacillus backii; Enterobacter; Pantoea and others</i> |
| | Beer samples or rinse water samples Vat, tanks, fittings, lines, tubes, blender | Membrane filtration 100 ml | Occasionally Identify source of contamination | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | <i>Pediococcus damnosus; Lactobacillus lindneri; Lactobacillus backii; Lactobacillus brevis; Lactococcus lactis; Enterobacter; Pantoea and others</i> |
| Beer processing from filtration to filler | Beer samples or rinse water samples Filter release point (dropper bottle) / Beer route (especially after changes, e.g. plate appliance, measuring devices, CO ₂ candles, valve junctions, bypasses) / Pressure tank / Filler feeder (dropper bottle) / Filler (Bottle-, barrel filler) | Membrane filtration 100 ml | Regularly during production / daily / weekly | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | <i>Pediococcus damnosus; Lactobacillus lindneri; Lactobacillus brevis; Lactobacillus backii; Lactobacillus casei and other Lactobacilli</i> |

Filling area (secondary contaminations)

| Process | Samples | Method/Sample size | Sampling frequency | NBB format | Culture vessel | Incubation days | Condition | Analysis | Detectable microorganism – most important species |
|---|---|---|--|----------------------|--|-----------------|----------------------------|---|--|
| Bottle cellar Draft beer filling station | Bottled beer (Wheat beer see "fermenting room") Draft beer detection of potential damages in bung hole area: place barrel that bung hole area is below beer level after 3 days, take sample | Membrane filtration ⁴ 50 - 500 ml | Regularly during production / daily | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | <i>Lactobacillus brevis; Lactobacillus backii; Lactobacillus lindneri; Lactobacillus casei and other Lactobacilli; Pediococcus damnosus³; Pectinatus; Megasphaera</i> |
| | Rinse water samples (sterile tap water or physiological salt solution) Empty bottles / Closures / Empty barrels / Bungs | Membrane filtration ⁴ 50 - 500 ml | Occasionally Identify source of contamination | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | <i>Lactobacillus brevis; Lactobacillus plantarum; Lactococcus lactis; Pectinatus; Megasphaera</i> |
| | Swab samples Direct or indirect weak points at washer / belts / filler / capper / periphery | Liquid enrichment | 2x per week in summer 1x per week in winter Identify source of contamination | NBB®-B-Am | Swab in test tube with 10 - 20 ml NBB®-B-Am | 3 | aerobic | Indicator change | <i>Indicator microorganisms of biofilms: Acetic acid bacteria; Lactococcus lactis; Lactobacillus plantarum and other Lactobacilli; exogenous yeasts; all beer spoilage microorganisms including Pectinatus and Megasphaera</i> |
| | Swab-rinse water samples ⁵ (see swab samples) | Membrane filtration ⁴ Important: Incubate samples anaerob, use anaerobic jar! | Occasionally Identify source of contamination | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | <i>Lactobacillus brevis; Lactobacillus casei; Lactococcus lactis; Pectinatus; Enterobacter</i> |
| | Air sampling Washer, bottle release, bottle inspector, bottle filler, capper, barrel filler | Air sampling direct on petri dish | Every 2 to 4 weeks | NBB®-A | Petri dish | 3-5 | anaerobic | Colony forming Indicator change | <i>Lactobacillus brevis; Lactobacillus plantarum; Lactococcus lactis; Lactobacillus casei and other Lactobacilli; Kocuria kristinae, Pectinatus; Megasphaera</i> |
| | CO ₂ or Compressed air | Slowly flow into NBB®-B Slowly flow into sterile water (~ 50 ml), Membrane filtration ⁴ | Occasionally Identify source of contamination | NBB®-B NBB®-A | Test tube or 50 ml swing stopper sample bottle or alternative bottle Petri dish | 3-5 3-5 | anaerobic anaerobic | Turbidity Indicator change Colony forming Indicator change | <i>Pediococcus damnosus, Lactobacillus lindneri; Lactobacillus brevis; Lactobacillus backii and other Lactobacilli; Lactococcus lactis; exogenous yeasts</i> |

1 Spoilage of *Enterobacter* only at pH of > 4.7 – e.g. yeast, wort, start of the fermentation, in yeast sediment.
2 Trace contaminations with *Pediococcus damnosus* show strong growth but often no or slight indicator change.
3 Spreading from Non-Filtration Area.
4 To create complete anaerobic conditions for the detection of *Pectinatus* and *Megasphaera* the membrane filter should be flushed with CO₂, before anaerobic incubation.

Interested? Find out about innovative NBB® developments in the future and our full range of DMD® culture media at: www.doehler.com



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