VINK CHEMICALS

Preservation: Trends and Challenges of Next generation of Metal Working Fluids

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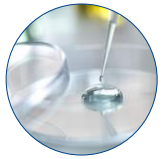
TOPICS

Biocides



Microbiology

Regulation

Researcher Perspective

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Preservatives have an impact on sustainability, as they enable a longer shelf life and help to minimise waste.

Manufacturing

The protection of products against microbial contamination starts at the manufacturing stage with the implementation of effective hygiene and safety standards

Transport

Consumer products are protected against microbial contamination by preservatives from the outset throughout their entire life cycle

Warehouse & Retail shops

The products remain durable in the shops' warehouses and shelves and are therefore available to all customers in sufficient quantities.

In use

Consumer products can be safely used as intended, as they are not contaminated by bacteria, yeasts or moulds.

Storage

When stored appropriately, the products remain functional and durable for a long time.

Empty containers

Effectively preserved products can be consumed completely. Opened containers/products need to be disposed of less often than unpreserved products, thereby reducing waste..

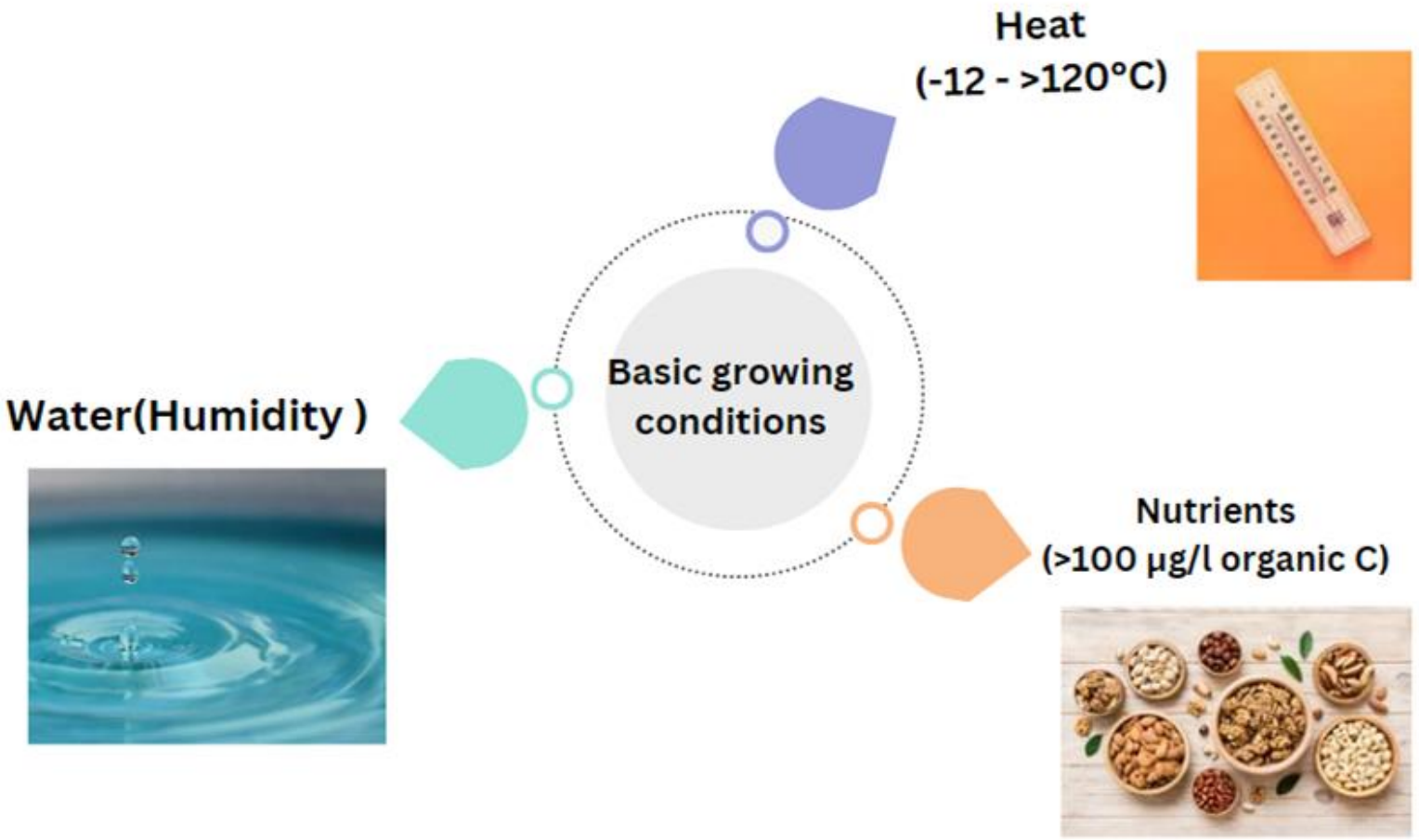
Recycling

An empty container can be recycled into new material, for example into new product packaging.

Responsible wording

Our R&D team determines the optimal amount of preservatives that should be added to consumables based on efficacy and safety

INTRODUCTION TO MICROBIOLOGY



MICROBIOLOGY : METAL WORKING FLUIDS

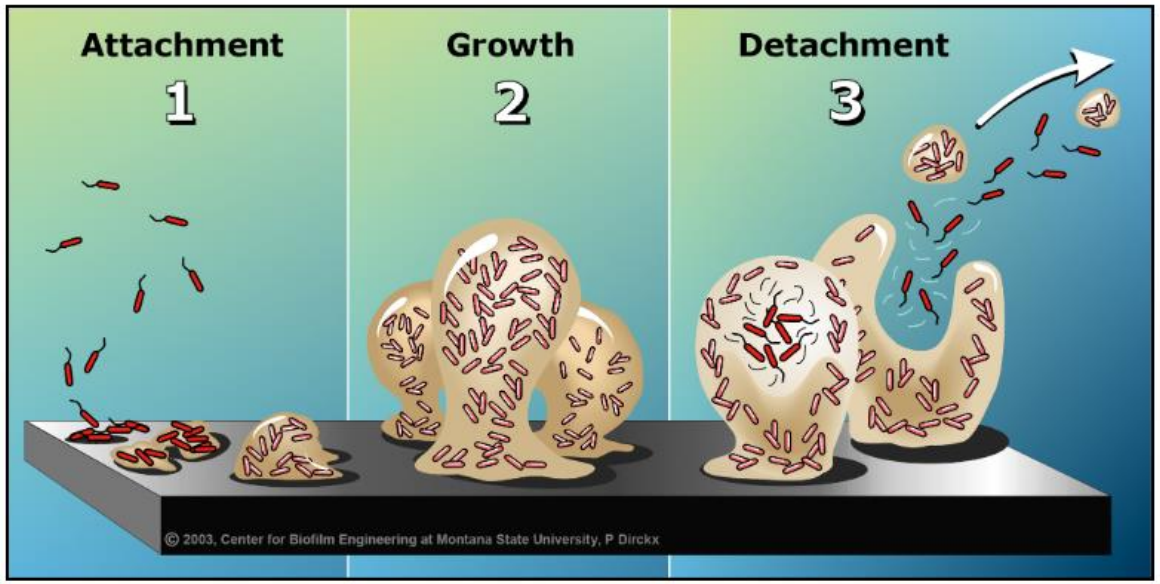
To assist in corrosion protection most MWF are designed to have pH of 8.0-9.5. Over the years we have seen the growing trend of pH shift towards 9.0-9.5. So, several factors needed to be improved, compared and modified

- Due to the high pH some microorganisms were already eliminated
- New test microorganisms were selected for their pH tolerance (pH range upto 10)

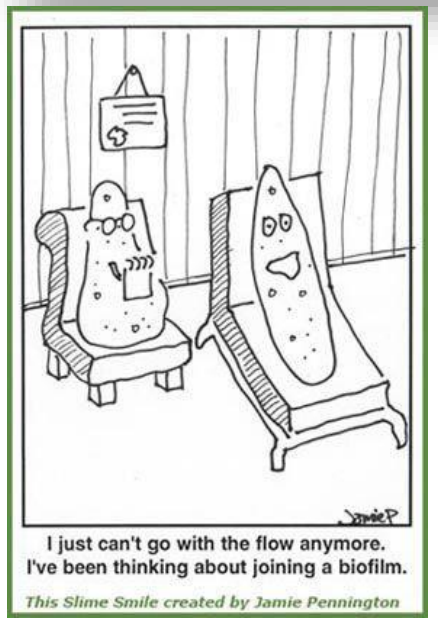
			Max. pH
Bacteria	Pseudomonas aeruginosa	MWF	9.5
	Pseudomonas alcaligenes	wastewater	9.5
	Coamamonas testosteroni	wastewater, water, soil	9.5
	Klebsiella pneumoniae	water, human	10
Yeast	Candida albicans	conspicuous in tests	10
	Rhodotorula mucilaginosa	wastewater, human, conspicuous in tests	10
Mould	Aspergillus fumigatus	soil, compost	8.8
	Fusarium oxysporum	humid environment	11
	Fusarium solani	plants, soil, humid environment	11

MICROBIOLOGY

The contaminating microorganisms can develop in the MWF in the form of suspended biomass but also on surfaces in contact with the MWF (reservoir wall, pipe interior and machine surface) in the form of fixed biomass and as floating biofilm at the surface of the fluid in reservoirs.



A microorganism inside a biofilm has a reduced sensitivity to biocides compared to the same microorganism in planktonic form.



Source: centre for Biofilm Engineering Montana State university
Smile slime created by Jamie Pennington

REGULATIONS

- CLP-Regulation
- REACH Regulation
- BPR-Regulation
- Chemical inventory listings

Classification, Labelling and Packaging (CLP) Regulation

Regulation (EU) No 528/2012 of the European Parliament and of the ((EC) No 1272/2008) is the European implementation of the United Nations' Globally Harmonized Systems (GHS).

Scope:

Ensure that clear information is provided to workers and consumers in the European Union on the hazards associated with chemicals, by means of the classification and labelling of chemical substances and mixtures.

REACH: INTRODUCTION AND IMPORTANCE

Regulation (EC) No 1907 / 2006 concerning Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

- Improving health and environmental safety
- Encourages alternative use of safer substances
- Every chemical needs to be registered or exempted

Restricts use of certain chemicals (Annex XIV, Annex XVII)

BPR

Regulation No 528/2012 concerning the making available on the market and use of Biocidal Products (BPR)

- Ensures a high level of protection of both human and animal health and the environment
- BPR governs harmonized rules concerning biocidal products (BP)

OECD
Organisation for Economic Co-operation and Development

Initial germ count: 100 cfu/ml

1. Take preventive measures

2. Analyse the situation




SUSTAINABLE MANAGEMENT OF HARMFUL ORGANISMS (Sumaho)

- Support antagonists
- Know the options
- Define the goal
- Decide on necessity
- Choose the approach
- Fight resistance
- Verify and document success

CRITERIA FOR THE SUITABLE BIOCIDE

When selecting a biocide for MWF, consider the following key criteria:

- **Regulatory Compliance** : Must adhere to local and international regulations, ensuring safety and legal use
- **Broad-Spectrum Activity**: Effective against a wide range of microorganisms and prevents biofilm formation
- **Low Concentration Efficacy**: Works effectively at low doses, reducing costs and minimizing impact on MWF properties
- **Stability**: Remains effective typical MWF pH ranges and temperatures
- **Safe Chemistries**: Avoids formaldehyde, skin sensitizers, and other harmful chemicals
- **Compatibility**: Does not react with other MWF components or cause phase separation
- **Non-Corrosive** : Safe for use with various metals
- **Human and Environmental Safety**: Low toxicity and biodegradable
- **Cost-Effective**: Affordable and long-lasting
- **Support** : Ensures long-term MWF stability

RESEARCHERS PROSPECTIVE: “REGULATIONS: CHANCE OR CHALLENGE”

Since BPR restricts the introduction of the new biocides.

Different categories of enhancers/boosters of biocide activity and alternatives to biocides i.e. “dual-use products”

Category of enhancer/booster and alternative agents	Examples
Organic permeabilizing agents	Ethylenediamine tetra-acetic acid (EDTA) Ethylene diamine disuccinate (EDDS) Polyethyleneimine (PEI)
Metals	Lithium copper
Organic and inorganic acids	Acetic acid Citric acid Phosphoric acid Sorbic acid
Multifunctional agents for self protection	Glycerol Levulinic acid

MIC of N-butyl-1,2-benzisothiazol-3(2H)-one

Test organism	MIC (mg/l)	*MIC (mg/l) BBIT+Enhancer
Bacteria		
Pseudomonas aeruginosa	610	50
Escherichia coli	20	50
Burkholderia cepacia	80	50
Yeast		
Candida albicans	20	50
Fungi		
Aspergillus brasiliiensis	20	50

* Currently test results of 50 ppm are available lower ppm's are been evaluated

TAKE HOME MESSAGE

- Holistic approach to preservation “Sanitisation should be implemented in the beginning”
- The most effective approaches for monitoring the use of biocidal products
- The role of improved performance of the equipment used for applying biocidal products
- As mentioned in sustainable use directive need to consider “careful consideration of all available methods” as well as “other forms of intervention”, and therefore goes beyond a product-centered approach
- To reach UN 2030 sustainability goal it’s important to combine the collaborative efforts of academic strengths of universities in problem-solving and research with the practical, application-focus approach of industry, and the regulatory and policy-making capabilities of government

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Preserved to last