

New generation of fungicides for leather preservation

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In the tanning industry is well known the problem of micro-organisms able to grow on leather during the different phases of process working.

Wet-blue hides are excellent substrates for fungal growth: storage temperature, acid pH, presence of water, proteins and fats constitute the most important conditions for the development and growth for a lot of moulds as *Penicillium spp.*, *Aspergillus spp.* and *Trichoderma viride*.

The fungal contamination appears as coloured stains on the leather, usually permanent.

Although a large number of active substances are known for the protection of leather from fungal growth a relatively small number of fungicides have received widespread acceptance.

The traditional requirement of the fungicides are:

- High activity against fungi
- Efficacy at acidic pH
- Temperature stable
- Low water solubility
- UV stable
- Compatible
- Non-discolouring
- Cost effective

Actually a number of factors are leading to demands for new fungicide with different or improved properties. The principle pressures for change arise as a result of pressure from the following sources:

- Environmental/Consumer Pressure

Increased awareness of the potential toxic hazard of chemicals used in consumer products has resulted in greater pressure from environmental and consumer groups to reduce the use of such materials.

- Legislative and regulatory changes

The main features of Biocidal Products Directive 98/8/CE (BPD) is to establish of a positive list of active substances and a National authorisation of Biocidal Products containing active substances on this positive list. PT 9 is the Product Type for Fibre, leather, rubber and polymerised materials preservation, and the dossier for the active substances must be submitted from 1.05.2008 to 31.10.2008. BPD establish clear criteria to insert the active substances in the Annex I: the Technical notes for Guidance in support of BPD specify that the risk to the general public from secondary exposure to these substances is unacceptable and geno-toxic substances should be considered as strong candidates for comparative assessment. This will have a strong impact on the biocide that will be available.

Moreover a great impact will occur as a result of three other pieces of relevant EU legislation - The Dangerous Preparations Directive (DPD-99/45/EC), the Marketing and Use/Limitations Directive (76/769/EEC) and The Dangerous Substances Directive (DSD-67/548/EEC). In particular the recent publication of the 29th Adaptation to Technical Progress (ATP) established from 31/10/05 that the Carbendazim fungicide labelling changes from harmful (Xn) to Toxic (T).

Thus the new fungicide requirements are:

- Regulatory approval
- Carbendazim free
- TCMTB free
- Low toxicity/ecotoxicity

Nevertheless, no single active substance has all these properties!

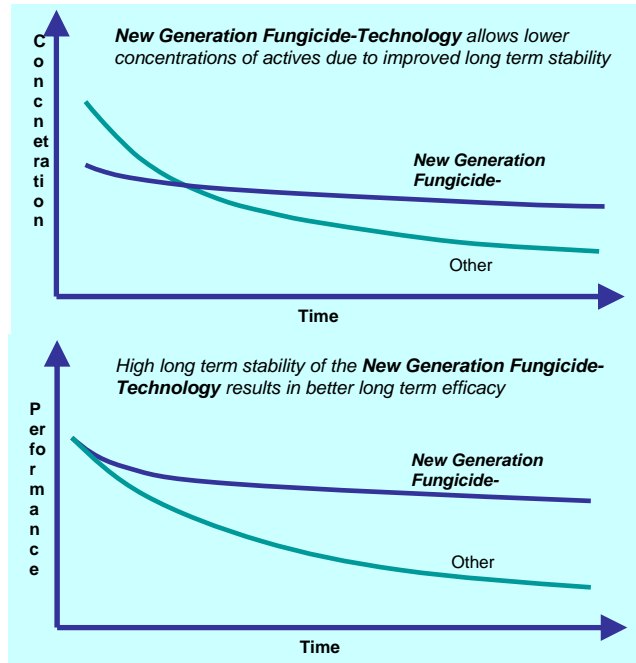
Several active substances are known on the market, with all the advantages and disadvantages.

- 3-iodopropargyl-*N*-butylcarbamate (IPBC):
Advantages: Wide anti-fungal activity, Low water solubility, Cosmetic approved;
Disadvantages: Discolouration possible, UV instability, Sulphite instability
- Zinc 2-pyridinethiol-1-oxide (ZNP)
Advantages: Broad microbiological activity spectrum, Low water solubility, Low toxicity
Disadvantages: May form coloured complexes, UV instability
- 2-*n*-octyl-4-isothiazolin-3-one (OIT)
Advantages: Wide anti-fungal activity, Low toxicity
Disadvantages: Sulphite instability

Optimisation of fungicide efficacy can be achieved by providing a protective mechanism for the substance or substances in question. The use of these mechanisms has enabled the development of a new biocide for leather industry, combining the earlier recognised ideal properties of the fungicides with the new requirements. For example, protection of OIT can be achieved by adsorption onto calcined silica or zeolite, where OIT is immobilised by weak electrostatic forces. Using a new formulation technologies we developed a “New Generation Fungicide” with the following characteristic:

- Mixture of “protected” IPBC-OIT-ZnP
- Broad microbiological activity spectrum
- Carbendazim-free
- TCMTB-free
- Improved UV stability
- Minimised risk of discolouration
- Minimised risk of secondary reaction
- Excellent long term stability
- Low levels of active agents, lower environmental risk

All the main characteristics of “New Generation Fungicide” comparing with the “Other Formulation” can be summary in the following charts:



This new biocide has been extensively evaluated in the tanning process for the wet-blue, wet-white and double-face production. Microbiological testing, using an inoculum with 10 specie of fungi, demonstrate the efficacy of “New Generation Fungicide” on leather, as reported in the following pictures:

