

VOCs FROM WOOD FIBERS INSULATION MATERIALS

VOCs from low density fiberboard measured with LECO PEGASUS® BT GC-TOFMS equipped with thermal desorption unit TD3.5+ and CIS as a cryo-focusing trap and a temperature programmable GC inlet.

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VOCs is in the indoor AIR

Nowadays the majority of people spend 90% of their lives in buildings - houses, schools, factories, offices, shopping centers, etc. That is why indoor air quality has a major impact on our health. Timber insulations help to control the internal environment of buildings. Steico within its products ensures keeping cold out, buffering external heat, regulating moisture content but also helping to promote breathable and healthy structures. Someone may ask, but thermal insulation products are not usually directly exposed to indoor air? After all, they are covered by different materials such as plasterboards, wood, bricks, or concrete, and that potential emissions from the insulation materials cannot get in contact with the indoor air. Nevertheless, the covering layers may not be gas-tight or may be perforated for the installation of technical building systems. And what is also important, the building owners have the right to be informed about the potential hazards connected to the insulation and construction materials used in his building.

To meet the needs of Steico product users, a volatile organic substance (VOC) emission measurement laboratory was established in the company's structure, thanks to which Steico has even greater control over processes and products. The laboratory has been equipped with modern apparatus – gas chromatography and mass spectrometry – LECO Pegasus BT GC-TOFMS. With the additional thermal desorption unit TD3.5+ connected directly to the GERSTEL Cooled Injection System (CIS), which is used as a cryo-focusing trap and as a temperature programmable GC inlet it is possible to measure VOCs from wood-based materials according to ISO 16000 and EN 16516.

Are we always aware of what is in the air we are surrounding ourselves with? It is easy to ignore harmful chemicals known as Volatile Organic Compounds (VOCs) as they are invisible, but long-term exposition to VOCs can cause serious illnesses. Steico focuses not only on the physicochemical parameters of its products but also ensures low emissions from the wood fiber insulation material. Nowadays due to the running project co-funding within sectoral program Woodinn implemented by the National Centre for Research and Development (NCRD) within Operational Program Smart Growth 2014-2020, works, on a new generation, low-density insulation material for traditional and pole buildings, are carried out.

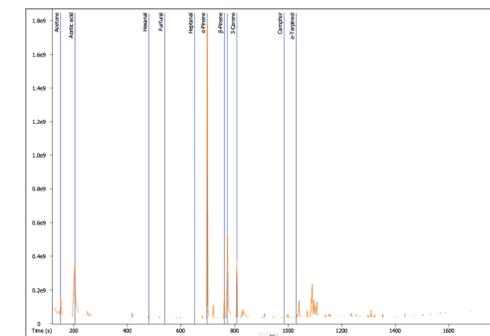
During the project implementation using the LECO Pegasus BT GC-TOFMS, solutions were integrated and developed that further reduce VOC emissions from insulation materials. The wood volatile constituents can more easily escape from a new board due to its very low density (around 80kg/m³). Therefore, during the work on this product, special care was taken to ensure that the emissions from it are also at a level that is safe for the user, as in the case of other Steico products. For this reason, when implementing the project, great emphasis was placed on the selection of such raw materials, as well as the adjustment of production parameters such that the emission from the new final product was also on a very low level.

Due to the fact that wood fiber insulation materials are around 80% made of pine wood, it can be expected that the main emitting substances from fiberboard are of natural origin such as for example terpene compounds, α - and β -pinene, Δ^3 -carene, monocyclic monoterpenes such as limonene, β -phellandrene, terpinolene, and aromatic compounds like p-cymene. During the production of wood fiberboard, pinewood is subjected to hydrothermal treatment which leads to the creation of aldehydes formed by the autoxidative splitting of free unsaturated fats and fatty acids. By selecting the appropriate production parameters of the defibration of the wood, drying of the wood fibers, and pressing of the wood fiber insulation materials it is possible to minimize decomposition of wood.

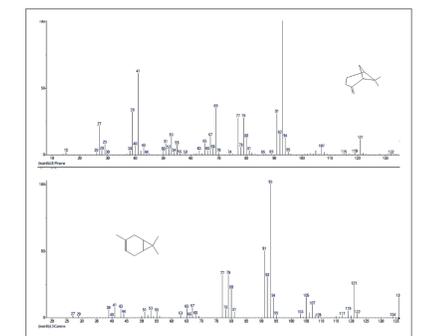
Additionally, for the production of low-density fiberboard in dry technology, it is necessary to use adhesive, hydrophobization agents, and in the case of a board with very low density, fire retardants which can also influence emission from the product. It is proven that lowering the pH of the environment leads to the intensification of emissions from products. Therefore, it is of great importance to select chemicals that in contact with natural wood will have the least possible impact on its decomposition and thus on the emission of undesirable substances. The developed chromatographic methods enable the control of individual raw materials before their use for production.

The LECO Pegasus BT GC-TOFMS equipment using the headspace technique allowed the capture of propylene carbonate in the adhesive at an early stage of raw material control. The knowledge gained, thanks to the thorough analysis and control of raw materials, in this case the binder, allowed to minimize or even eliminate the emission of propylene carbonate from finished products.

The research carried out in the Woodinn project has made it possible to minimize emissions even further from such natural insulation materials as Steico products by optimizing the input raw materials and the technological process itself. The use of LECO Pegasus BT GC-TOFMS equipment allows not only for quick reaction already during the control of the raw materials themselves as well as during changes in the process, but also allows for continuous development and improvement of insulation materials.



5. VOCs from low density fiberboard



6. Evaluation of VOC based on the mass spectrum



1. LECO Pegasus BT GC-TOFMS



2. Steico VOCs laboratory



3. From round wood to fibers - wood preparation



4. Production of low density fiberboard LDF

