Buildings for citrus juices and essential oil manufacturing: the floor design

Ing. PhD Giuseppe Cardinali\*1, Prof. Francesco Barreca\*2

1 Mediterranea University of Reggio Calabria – Agraria Department – Phone: 3404711654 – E-Mail: gcardinali@unirc.it

2 Mediterranea University of Reggio Calabria – Agraria Department – Phone: 3476299760 – E-Mail: fbarreca@unirc.it

**Keywords.** Essential oil, safety slipperiness, floor materials, wear safety, agri-food industry safety.

**Abstract.**

It is essential to pay equal attention in the agroindustry buildings design to all systems and components, but the floor design is very often neglected. The hot oils, greases and chemicals used in processing invariably end up on the floor and corrode the surface. Thermal shock from hot water wash downs crack and disintegrate weak surfaces and frequent impacts from heavy machinery, foot and vehicle traffic dent, damage and destroy unprepared floors. In particular, within the processing area of citrus juices and essential oil, floors can be subject to spillages of water, essential oil, citric acid, natural chemical substances contained into citrus products, generating both a slip and hygiene risk. These substances can generate safety problems related not only to slipping and cleanability but also wear, and deterioration, which they put down to a choice of the wrong floor material.

The essential oils on the market are mainly obtained from vegetable substances and in particular from citrus fruits, using low-value materials such as rind, pulp and seeds, remaining parts of the production activities. The fruits of all citrus species constitute a potential source of essential oils and are of commercial interest, such as lemon, orange, grapefruit and other more particular ones such as bergamot, a typical citrus fruit of the south Italy, whose essences are used in the food, cosmetic and pharmaceutical industries.

Essential oils are composed of a volatile and a non-volatile part, the latter consisting of numerous substances such as: fatty acids, waxes, coumarins, psoralens, flavonoids, etc.

A study was carried out on the right solutions design of the floor in the buildings for citrus juices and essential oil manufacturing. Were analysed the floor main performances, in respect to workers safety, hygiene risk and management in use, to choice the more suitable floor material. Were evaluated the effects that a spillage of citrus essential oils and juice has on the surface characteristics of flooring from more traditional ones, such as ceramic ones to the most innovative ones such as resins.

The test were carried out in accord to international standard or national rule as the Italian Ministerial Decree 236/89 to evaluate the dynamic friction coefficient for slip risk, measured with the Tortus tribometer, or specific tests, to assess the level of cleanability and wear resistance of the flooring.