Continuous Process for Oakmoss Extraction

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Oakmoss (Evernia Prunastri L. Ach.), along with other tree mosses, is among the most voluminous botanicals which are solvent extracted for use in perfumes. These extracts are manufactured with heavy labor costs. Large quantities of solvent have to be circulated and evaporated. This requires high energy costs. Therefore, there is a place for a quicker continuous automated process.

Traditional Batch Extraction Processes

Despite the fact that each company has a special method of oakmoss extraction, the basis is similar everywhere.[1] The extraction units are generally separated in two parts:(I) lichen preparation; and(II) solvent extraction linked to solvent evaporation. The moisture content of the stored lichen is around 12%. Before solvent extraction, the lichen is humidified. It can be sprayed with hot water and kept wet overnight as fermentation takes place. The temperature tends to increase and can reach 40°C to 50°C in the heart of the bulk. Today, there is a tendency to simply sprinkle oakmoss lichen with water at room temperature. This prevents dust production in the workshop where the material is left to stand for two or three hours. Moreover, such a moistening restores a permeability to the cell walls which makes the solvent extraction easier. Extraction is still mostly done with benzene affording concretes in the 4-5% yields. The replacement of benzene by hexane results in lower yields (between 1.5 and 3%). Extraction with ethyl alcohol allows the yields to rise to 15%. However, in common industrial practice, this solvent is not used alone but in conjunction with benzene or hexane. Extraction temperature varies from 40°C to the solvent boiling point. The total duration for traditional solvent extraction often exceeds 12 hours.

Industrial Continuous Extraction Process

Preliminary experiements, performed with a laboratory apparatus, have shown that the product obtained in continuous extraction conditions directly from the dry oakmoss lacks the features of the classical oakmoss concretes.

This is due to the fact that the cleavage of the depsides gives the well-known odoriferous compounds. This does not occur significantly due to the lack of time.[2-4] Therefore, these compounds must be generated inside the lichen before the solvent extraction takes place. The easiest way to achieve this result is to treat oakmoss with steam in order to cause depsides hydrolysis.

The industrial installation designed for continuous manufacturing of oakmoss concrete is diagrammed in Figure 1.[5] Three operations are completed in this plant: lichen hydrolysis, lichen extraction, and stripping of the residual solvent from extracted lichen ("solvent recovery").

Oakmoss goes into the top of the hydrolysis vessel and passes down through the vessel while steam, entering at the bottom, is carried upwards. The oakmoss that exits at the bottom of the hydrolysis vessel is carried by continuous screw conveyor to the top of the extraction vessel. Here the oakmoss travels down through the vessel as the extraction solvent rises through it to exit at the top of the vessel. The solution from the extractor is fed into a falling film evaporator, the concrete is collected at the bottom and the solvent is condensed and returned to the storage tank.

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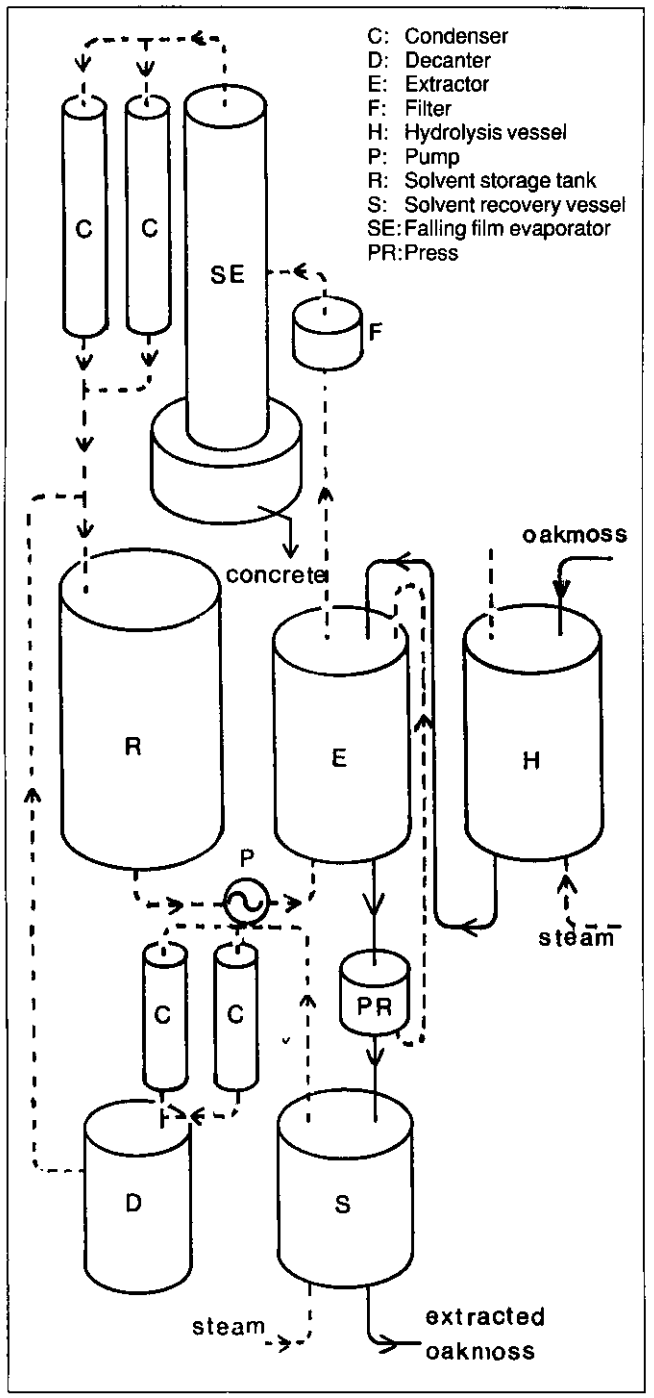

Figure 1. Industrial Continuous Solvent Extraction Installation for Oakmoss Lichen.

Table I: Comparison of the Continuous and the Traditional Processes.

	Traditional process	Continuous process (pilot plant)
Area occupied by the unit	150m^2	30m^3
Average size of an extractor	5,000 litres	1,200 litres
Number of extracts	4	1
Total extraction volume	20,000 litres	1,200 litres
Quantity of required in the workshop	30,000 litres	2,000 litres
Quantity of oakmoss in each extractor	600 kg	250 kg oakmoss continuously present in the extractor
Average time for an extraction	24 hour batches	3 hour cycles
Average daily production	2,400 kg lichen processed	2,200 kg lichen processed
	103 kg concrete obtained	95 kg concrete obtained

The oakmoss leaving the extractor contains about twice its own weight of solvent. During the transfer towards the last vessel, the oakmoss is compressed by a special device so that it releases half of the retained solvent which is returned to the extractor.

The remaining solvent is vaporized by allowing steam to pass through the oakmoss with the vapors flowing to the condensers for solvent recovery. The spent material conveyed out of the last vessel is thoroughly free from solvent.

All the steps of this process are automatically controlled and are linked together to create an integrated continuous process. Temperature controls in various parts of the system provide optimum hydrolysis and extraction conditions, and are a key element of quality and consistency. The advantages of this process over the classical one are listed in Table I.

References

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