CONSTRUCTED WETLANDS SYSTEM FOR THE WASTEWATER TREATMENT AND FOR SLUDGE DEHYDRATION OF THE COOPERATIVE WINEGROWERS' ASSOCIATION OF CASORZO E NEIGHBORING AREAS

ORIGINAL NEED

The wine cooperative of Casorzo and neighboring areas was devoid of a sewage treatment plant of the discharges of the production, because the existing traditional sewage treatment plant, was disused in 2001 because of its inadequate functioning, the solution adopted in the meantime was to collect and transport the waste products to approved plants, with a significant increase in the expenditure of the Consortium.

For this reason the wine cooperative of Casorzo chose to build a new wastewater treatment plant, which would guarantee a final discharge in compliance with existing law and at the same time would be characterized by simple maintenance and low production of waste products.

DESCRIPTION

The project consists in the treatment of wastewater and sewage sludge discharged from the winery through natural purification techniques (constructed wetlands).

The discharges of wineries through the constructed wetlands is of recent application (Grismer et al, 2001, Shepherd et al, 2001), but supported by scientific monitoring data that have highlighted the excellent applicability in Italy (have been recently published the results of some research carried out on three constructed wetlands plants located in Tuscany (Masi et al, 2002, Conte et al, 2003, Martinuzzi et al, 2003).

LOCATION
Municipality of Casorzo
Province of Asti
Italia

COMMITTANT
Winegrowers' association of Casorzo e neighboring areas

NUMBER OF PERSON EQUIVALENT
30.000 q of wine produced per year

TIPOLOGIA DI REFLUO
Agro-industriale (alto carico organico)

PLANT TYPOLOGY
HF + FWS; VF for sludge dehydration

AREA (M^2)
500 (350 + 150); 100 for sludge dehydration

YEAR OF REALIZATION
2004

The constructed wetlands is also an attractive solution for the treatment of sludge produced during primary sedimentation; successful applications were made in Germany, Denmark and France (Nielsen and others, 1990-2004; Lienard and others, 1995; Lesavre and other , 2002). The material to be disposed of, with cadence nearly a decade, is an organic compost of good quality, used as fertilizer in agriculture.

The system was sized to meet the purification standards required by regional law (regional law of 26 March 1990 No. 13) and national law (D.Lgs. 152/99).

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SIZING

The criteria adopted for the proposed design arising from following directions:

- estimation of the users of the facility and the staff employed as reported by the customer;
- theoretical estimation of the values of flows and concentrations of some parameters of the wastewater produced by work according to the values traceable in the scientific literature and in accordance with existing analysis;
- comparison with known cases of monitored systems.

The sizing has been done on the scenario most critical, most likely coinciding with the months of September-October. The winery produces about 24,000 q wine, and is expected to increase production up to 30,000 q. The data obtainable from the scientific literature reported a production of organic load variable between 0.03 and 0.14 gCOD per day for kg of wine produced (in reference to the period of maximum production of the discharges) and are in line with the sizing design data (in reference to the maximum scenario you would get in fact 0.8 gCOD/kg of wine). According to data provided by the customer water consumption in 2002/2003 amounted to about 1800 m^3.

Based on the data described above were taken the following project data:

- average flow in the most critical scenario: 8 m^3/d;
- concentration of COD in the most critical scenario: 43400 mg/l;
- average flow rate in the rest of the year: 4 m^3/d;
- Concentration of COD in the most critical scenario: 15000 mg/l.

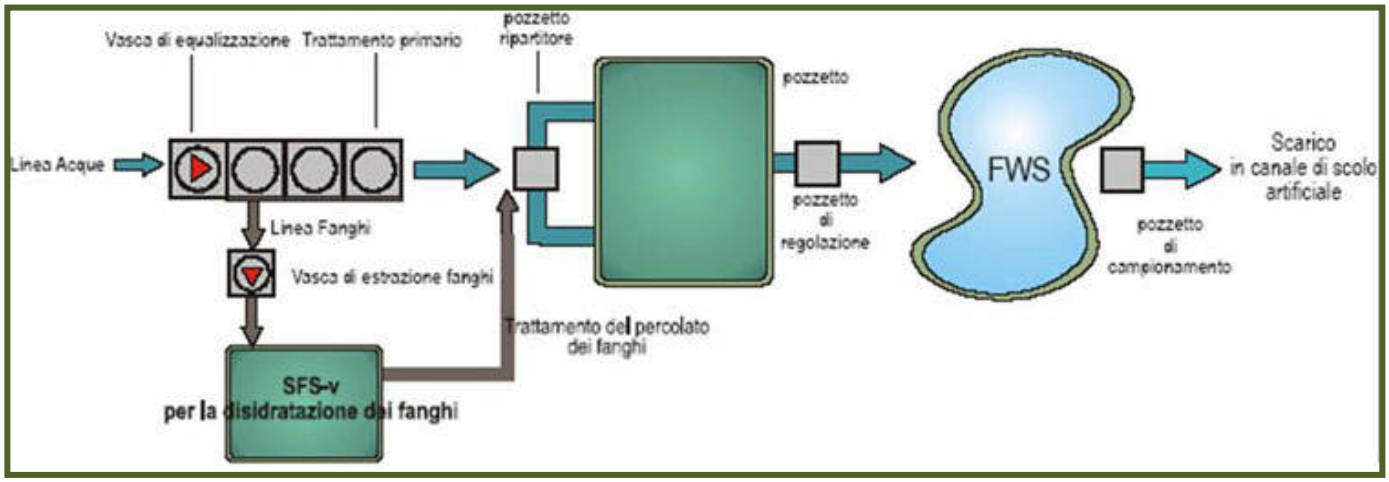
The adopted sizing equations lead to accurate useful surfaces of the treatment system.

- HF basin surface area = 350 m^2
- FWS basin surface area = 150 m^2

As regards the sizing of a constructed wetland for sludge dewatering have been followed Danish project guidelines (Nielsen, 2004) and French (Lienard et al, 2003), the first result to be the most reliable as the result of 10-15 years of experience in this field, while the latter (in line with the Danish ones) have the advantage of having found application in climate conditions much more similar to the Italian ones. On the basis of p.e. corresponding to the pollution load of product it is estimated an annual production of sludge in the septic tank (3 chambers design) amounted to 72 m^3, assuming to fresh mud a dry matter content of 5%, this corresponds to an annual total of 3600 kg of dry matter per square meter. So requires at least 72 m^2 of filter area.

Based on these project assumptions, it was decided to adopt two basins of 100 m^2 of total area. The tanks will be fed alternately performing an extraction of mud from the septic tank every month, and then observing a Resting Period of 2 months for each tank, enough to get a good dehydration of mud.

Based on of the nature of the wastewater and the data reported in the scientific literature of existing dehydration plants by constructed wetlands, it is expected a growth rate of the sludge level in the basin of about 15 cm year: in this way, the bed will need to be emptied after about 8-10 years.



Block scheme of the plant