Textile wastewater treatment: Aerobic granular sludge vs activated sludge systems

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**A R T I C L E   I N F O**

Article history:
Received 20 October 2013
Received in revised form 21 December 2013
Accepted 27 January 2014
Available online 5 February 2014

Keywords:
Textile effluents
SBBGR treatment
Centralized treatment plant
Ozonation
Sludge production

**A B S T R A C T**

Textile effluents are characterised by high content of recalcitrant compounds and are often discharged (together with municipal wastewater to increase their treatability) into centralized wastewater treatment plants with a complex treatment scheme. This paper reports the results achieved adopting a granular sludge system (sequencing batch biofilter granular reactor – SBBGR) to treat mixed municipal-textile wastewater. Thanks to high average removals in SBBGR (82.1% chemical oxygen demand, 94.7% total suspended solids, 87.5% total Kjeldahl nitrogen, 77.1% surfactants), the Italian limits for discharge into a water receiver can be complied with the biological stage alone. The comparison with the performance of the centralized plant treating the same wastewater has showed that SBBGR system is able to produce an effluent of comparable quality with a simpler treatment scheme, a much lower hydraulic residence time (11 h against 30 h) and a lower sludge production.

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1. **Introduction**

The textile sector is of great importance in the European economy: the manufacture of textiles, clothing and leather was the main activity of over 267,000 enterprises in the Member States in 2006 (European Commission, 2009) and textiles and wearing apparel accounted for about 3.6% of the EU-27 manufacturing in terms of value added and 6.3% in terms of employment in 2008 (European Commission, 2011). In particular, Italy is the leading producer, generating about one third (33.6%) of EU-27 value added in this sector in 2006, followed by Germany (12.1%), France (11.6%), Spain (9.2%) and the United Kingdom (7.8%) (European Commission, 2009). Moreover, Italy is the only specialised state, as in 2006 this sector contributed 3.4% of the value added generated in its non-financial business economy, three times the average contribution recorded across the EU-27 (European Commission, 2009).

An important environmental issue related to such a relevant economic sector is the production and discharge of big volumes of highly polluted wastewater, due to the consumption of about 100–200 l of water per kg of textile product (Bechtold et al., 2004) and to the use of an immense range of