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ANAEROBIC DIGESTION OF SOLID LUBRICANT WASTE FROM STEEL WIRE DRAWING

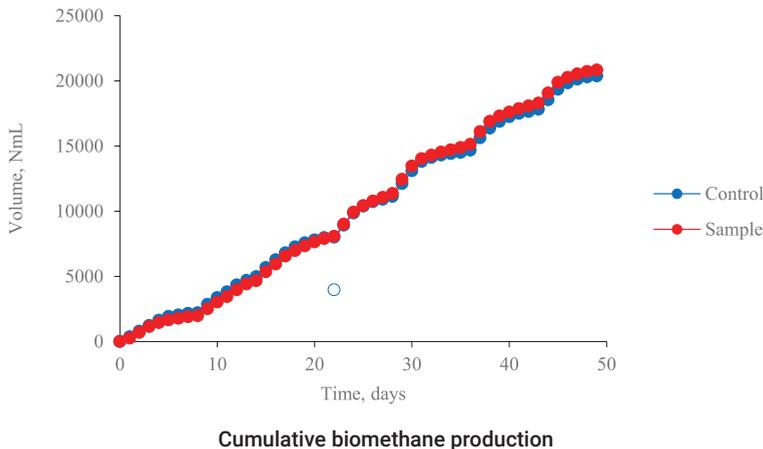
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Abstract – In the framework of the STAR (Stearato dai processi di Trafilatura del filo di Acciaio come Risorsa) project, funded by the Italian Ministry of the Environment, the valorisation of stearate based solid lubricant waste from wire drawing process as an energy source is investigated. As for anaerobic digestion, preliminary tests determined a biomethane production in the range 500–900 L/kgVS, much higher than the production from animal waste (around 400 L/kgVS). On this basis, co-digestion of the waste with primary sludge from wastewater treatment was tested. The experiments used 2-litre reactors with a 1.5litre working volume, equipped with valves, gas bags, and connected to an Automatic Methane Potential Test System for real-time biomethane monitoring. Reactors, mixed every 30 minutes, were filled with anaerobic inoculum and sewage sludge, flushed with nitrogen, and maintained at 35 °C. Following a stabilization period, the reactors were operated in semi-continuous mode, with a hydraulic retention time of 3 weeks. Weekly, a digestate sample of 0.5 L was replaced by an equivalent amount of fresh substrate: primary sludge with 10%VS stearate waste in the sample reactor and primary sludge in the control reactor. Before the feeding, the substrate was concentrated to 30 g/L of total solid. This solid concentration was maintained to ensure an Organic Loading Rate of around 1 g·L·d⁻¹ and to enhance operational stability. Cumulative biomethane production as a function of time (Figure) reached up to more than 20 NL in seven weeks and did not show significant differences between sample and control, thus supporting the hypothesis that anaerobic digestion is a suitable treatment for this type of waste.

Keywords – Biomethane; primary sludge; semi-continuous reactor; stearate waste



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