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II CONVEGNO **AISSA #UNDER40**

» **Sassari, 1-2 luglio 2021** «

BOOK OF ABSTRACT

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info@ideegrafica.it | www.ideegrafica.it

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#C5 Emission abatement systems in pig barns. Environmental impact evaluation with the Life Cycle Assessment approach

Giuseppe Coppola, Cecilia Conti, Michele Costantini*, Jacopo Bacenetti, Marcella Guarino

Dipartimento di Scienze e Politiche Ambientali, Università degli Studi di Milano.

*Corresponding author: michele.costantini@unimi.it

Livestock activities are responsible for remarkable environmental impacts. Ammonia (NH_3) is the most common air pollutant in pig farms, affecting animals and workers' health, and causing damages to ecosystems. Hence, there is a need to reduce NH_3 emissions. Many mitigation strategies can be applied to limit gaseous emissions, such as the application of air treatment technologies.

In this study, carried out during the APPROACh project ("Sistemi filtranti per la riduzione di polveri, odori e ammoniaca e per migliorare il benessere di animali e operatori all'interno delle porcilaie"), the environmental impact of a typical Italian pig farm, adopting a wet acid scrubber to abate NH_3 emissions, was evaluated using the Life Cycle Assessment approach. One kg of live weight (LW) was selected as Functional Unit. Two scenarios were considered.

The baseline scenario (BS) represents the situation as it is, while the alternative scenario (AS) a wet scrubber prototype (with 70% ammonia removal efficiency) was adopted.

For 8 of the 12 evaluated impact categories, AS shows the highest environmental impact, due to the scrubber construction and maintenance. However, it was the best for those impact categories most affected by NH_3 . Observed reduction ranged from 10% (for terrestrial acidification, TA, and terrestrial eutrophication, TE) to 0.4% (for marine eutrophication, ME). The climate change impact was 3.55 kg CO_2 eq kg^{-1} LW and 3.65 kg CO_2 eq kg^{-1} LW for BS and AS, respectively. For almost all impact categories, the consumable materials for wet scrubber operation represented around 85% of the total impact of the scrubber. The results of the sensitivity analysis showed that variation in NH_3 removal efficiency had the greatest effect on particulate matter formation, TA, and TE. The achieved results provide a first quantitative indication of the environmental benefits that can be achieved using wet acid scrubber in naturally ventilated pig facilities.

***Sistemi di abbattimento delle emissioni nelle porcilaie.
Valutazione ambientale con analisi del ciclo di vita***

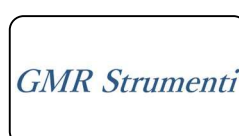
L'attività zootecnica è responsabile anche di impatti negativi sull'ambiente. L'emissione di gas climalteranti è l'aspetto più noto ma, tuttavia, non vanno trascurati anche gli effetti legati all'emissione nell'ambiente di composti come l'ammoniaca, gli ossidi di azoto, i nitrati e i fosfati. Per il settore suinicolo, le emissioni di ammoniaca sono dannose non solo perché, una volta emesso in atmosfera questo composto è un precursore delle polveri sottili, ma anche perché, all'interno delle porcilaie, elevati livelli di NH_3 e polveri possono creare problemi respiratori agli animali, ridurre il loro benessere e, in generale, influenzare negativamente l'efficienza del sistema.

Il progetto APPROACH "Sistemi filtranti per la riduzione di polveri, odori e ammoniaca e per migliorare il benessere di animali e operatori all'interno delle porcilaie" ha l'obiettivo di testare sistemi di abbattimento che, installati all'interno degli allevamenti, siano in grado di monitorare in continuo e, se necessario, abbattere le concentrazioni di NH_3 . Sono stati analizzati due scenari: base (BS), rappresentante la situazione attuale; e Alternativo (AS), in cui è in funzione il prototipo di wet acid scrubber che produce una riduzione del 70% delle emissioni di ammoniaca nel corso della stabulazione.

L'unità funzionale selezionata è 1 kg di peso vivo mentre i confini del sistema considerano tutti i processi fino al cancello aziendale (approccio "from cradle to farm gate") escludendo quindi macellazione degli animali e distribuzione della carne. Dodici impatti ambientali sono stati valutati. La riduzione dell'impatto è variata dal 10% per acidificazione ed eutrofizzazione terrestre fino al 0,4% per l'eutrofizzazione marina. Viceversa, per il riscaldamento globale si ha un aumento dell'impatto legato alla presenza dello scrubber (3,55 kg CO_2 eq kg^{-1} e 3,65 kg CO_2 eq kg^{-1} per BS e AS, rispettivamente). Il consumo di acido e di elettricità sono responsabili di circa l'85% dell'impatto legato al funzionamento dello scrubber.

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Si ringrazia inoltre il Dipartimento di Agraria ed il Corso di Dottorato in Scienze Agrarie



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