NEWSLETTER LIFE MEGA PROJECT
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Life-MEGA

Smart computing system to monitor and abate the indoor concentrations of NH3, CH4 and PM in pig farms

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The project

The LIFE MEGA project, funded by the LIFE program of the European Union, was created with the **aim of reducing ammonia and particulate matter emissions in pigsties and in the atmosphere** by treating the air present in pig shelters with two different abatement systems: a wet scrubber and a dry filter.

The lead partner of the project, which began in October 2019 with an expected duration of three years, is the **Department of Environmental Science and Policies of the University of Milan**. The partnership involves the **Institute of Research and Agri-food Technology** (**IRTA, Spain**) and two Italian companies: **Rota Guido Srl**, specialised in the construction of livestock facilities, renewable energy plants from biogas, and biomass and sewage treatment plants, and **NUVAP Spa**, pioneer in indoor air quality management.

Thanks to the technology developed by Nuvap Spa, a set of **online microclimatic devices** has been created. These tools will continuously monitor, through special sensors, the concentrations of ammonia and particulate matter present inside the pig shelters.

The sensors placed inside the online tools will continuously detect data. These data are collected in a cloud platform and can be easily consulted on any connected device (PC, smartphone, tablet).

The air treatment systems consist in a **dry filter** (a technology already present on the market and employed, for example, in the bakery sector) and a **wet scrubber**, the prototype of which was created by the partner Rota Guido Srl. This prototype is composed by two tanks, one containing water while the other is filled with a solution acidified with citric acid. The air gets withdrawn from the pigsties, washed - thanks to the passage through the two tanks - and finally returned to the shelters. These technologies are being tested in two Italian pig farms in the pig fattening phase and in two Spanish farms in the gestation and weaning phase.

During 2021, the abatement systems will be progressively managed by a "smart" control unit which, by monitoring the environmental parameters in real time, will activate their operation accordingly in order to maintain a proper level of air quality with respect to the health of animals and operators, minimising energy consumption at the same time.

Installed technologies

At the beginning of October 2020, the wet scrubber prototype was installed in an Italian and a Spanish farm. The scrubber consists of two tanks, the first containing water for capturing dust and odours, while the second contains a 15% citric acid-based solution for ammonia abatement.

In November 2020, Nuvap Spa installed the microclimatic tools in the Italian project site. The tools were installed in the room equipped with the scrubber, in the one with the dry filter, and in the control room.

The same scheme was also followed at the project site in Spain. These devices use different types of sensors based on the indoor pollutants that need to be monitored. The sensors selected for the project detect: NH3, PM, VOCs, temperature, and relative humidity.

During the month of November 2020, the dry filter was installed in Italy at the Azienda Cascina Antegnatica (Tavazzano con Villavesco, Lodi).

Monitoring

Protocols for monitoring and measuring the NH3 and PM environmental parameters have been arranged. In addition, a protocol for the assessment of animal welfare has been prepared.

Abatement NH3 and PM

A comparison will be made between the results obtained with the different abatement systems and what is observed in the control rooms to verify the effectiveness of the wet scrubber and dry filter in reducing emissions.

In December 2020, the validation campaigns of the microclimatic devices began at the Azienda Cascina Antegnatica. The data collected by the devices are compared with those collected during the Gold Standard, in which: i) the concentration of NH3 is measured with a Draeger multigas sensor; ii) the PM is assessed with the Haz Dust EPAM 5000 system. The Gold Standard will allow to assess the reliability of the Nuvap tools which, once validated, will be made "smart" through an algorithm that will make it work as an actuator for the abatement systems.

To evaluate the effectiveness of the scrubber, samples are collected weekly from the two tanks. Those samples are then analysed in the laboratory to determine the concentration of N-NH4 and thus estimate the NH3 retained by the water and by the citric acid solution.

Website and social

The project website has been created. It is available in Italian, Spanish and English at the following link:

lifemega.unimi.it

For updates on project activities, it is also possible to follow the project's social media channels:

Notice boards

The project notice boards were delivered to all partners and host companies involved in Italy and Spain. The notice boards are billboards that identify the project sites, explain the project activities and objectives according to the partner involved, and give relevance to the funding received through the LIFE programme.

Kick off

On 29 November 2019, the project kick off meeting was held at the University of Milan. The kick off provided a platform for all partners to jointly discuss the issues related to poor air quality in pig shelters and the technologies envisaged in the project actions in order to reduce ammonia, particulate matter and greenhouse gases emissions in pig farming.

Conferences

The LIFE-MEGA project was presented at the following conferences:

- Festival of Sustainable Development 2020 "Pillole di Sostenibilità" - "Sistemi di abbattimento dell'ammoniaca in porcilaia"
- LCA Food 2020 - "Life cycle assessment of pig production in Italy considering a wet scrubber ammonia abatement system"
- Ecomondo 2020 - "Improvement of human health and environmental costs in the European Union by air scrubbers in intensive pig farming"
- 9th Conference of the Italian LCA Association - poster "Emissioni provenienti dall'allevamento suinicolo: valutazione dell'impatto ambientale considerando l'utilizzo di uno scrubber per il trattamento dell'aria"

Results

The data analysis is still in progress and will be the subject of next newsletter.

Stay tuned!

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