

Capture and reuse of CO₂ at a pig slaughterhouse: from WWTP to the stunning process

Summary

The project consists of developing a pilot system for capturing gases emitted by the pig slaughterhouse wastewater treatment plant (WWTP) and separating the CO₂ for reuse in pig stunning before slaughter. Thus, it aims to: reduce greenhouse gas emissions from the slaughterhouse treatment plant; reduce consumption of CO₂ that the slaughterhouse has to acquire for the stunning phase; and transfer the technology for application in the entire slaughter industry and in other types of industries that use WWTPs.

The actions that this project is based on are: 1) development of a pilot system to capture the gases emitted in the reactor of the slaughterhouse's WWTP; 2) determination of the composition of the captured gases; 3) testing of various techniques to recover the CO₂ present in the gases emitted by the WWTP in order to determine the optimal method; 4) Determination of the maximum production of recoverable CO₂ and analysis to assess its validity for use in the stunning of pigs; 5) experiments on the stunning of pigs with CO₂ recovered from the WWTP, discarding any possible sanitary incompatibilities of this CO₂ with the animals, and analysis of the quality of the meat obtained in order to determine possible differences with respect to the meat obtained using normal commercial CO₂.

Dissemination and knowledge transfer actions will also be undertaken throughout the course of the project.

Objectives

Capture the carbon dioxide produced at the wastewater treatment plant (WWTP) of a pig slaughterhouse to reuse it in the stunning of the pigs prior to slaughter.

The specific objectives are to:

- Capture the gases emitted in the reactor of the WWTP of the slaughterhouse and determine their composition.
- Separate the CO₂ from other gases.
- Determine the quantity of CO₂ that can be recovered from the gases emitted by the WWTP and its validity for application in stunning at the slaughterhouse.

Description of the actions carried out in the project

1. Capture of the gases emitted in the reactor of the slaughterhouse's WWTP.
2. Determination of the composition of the gases emitted in the reactor of the slaughterhouse's WWTP.
3. Separation of the carbon dioxide present in the gases emitted in the WWTP.
4. Determination of the production of recoverable CO₂ and analysis of the same in order to assess its validity for use in the stunning of pigs.
5. Pig stunning experimentation with CO₂ recovered from the WWTP.

Final results and practical recommendations

-The average concentration of CO₂ obtained from the samples of gases emitted by the WWTP reactors (1.51%) and the load of the Moianès Regional Slaughterhouse WWTP reactors is high enough for self-sufficiency in the supply of CO₂ to ensure pig stunning. This would lead to financial savings in the purchase of food grade CO₂ and a decrease in greenhouse gas emissions (specifically CO₂) produced by the slaughterhouse treatment plant.

-The capture and separation of CO₂ from WWTP gases is possible with current technologies; more specifically, the methodology of chemical absorption in monoethanolamine (EMA) aqueous medium has proven to be effective. However, capture/separation costs are currently high (costs of acquisition, energy and maintenance).

-No obstacles to using CO₂ recovered from the WWTP, compared to food grade CO₂ currently in use, that could affect animal welfare or meat quality were observed.

-One of the main problems is how to capture gases from the WWTP. It has been achieved experimentally, but extrapolating this to the entire reactor would involve a change in reactor design. They are usually open to facilitate maintenance (repairs of aerators, stirrers, etc.), whereas they would have to be closed in order to capture gases efficiently. This would mean additional costs in constructing and/or adapting the WWTPs to obtain CO₂.

-Currently, production and purchase costs of food grade CO₂ are low, which means it is not an expensive gas and is readily available as a chemical industry by-product. However, consideration needs to be given to a future scenario in which greenhouse gas emissions are an additional cost for companies and where sustainability and reducing environmental impacts are rewarded.

Conclusions

It may be concluded that the capture and reuse of CO₂ produced by a pig slaughterhouse WWTP for use in the stunning process is technically possible.

Leader of the Operational Group

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Subject area(s) of application

- Agricultural production system
- Agricultural practice
- Agricultural equipment and machinery
- Livestock farming and animal welfare
- Vegetable production and horticulture
- Landscape / Territorial management
- Pest and disease control
- Fertilisation and nutrient management
- Soil management
- Genetic resources
- Forestry

<input type="checkbox"/>	Water management
<input type="checkbox"/>	Climate and Climate Change
<input type="checkbox"/>	Energy management
<input checked="" type="checkbox"/>	Waste and by-product management
<input type="checkbox"/>	Biodiversity and environmental management
<input type="checkbox"/>	Food quality/processing and nutrition
<input type="checkbox"/>	Supply chain, marketing and consumption
<input type="checkbox"/>	Competitiveness and agricultural and forestry diversification
<input type="checkbox"/>	General

Geographical area(s) of application

PROVINCE(S)	REGION(S)
Barcelona	El Moianès

Dissemination of the project (publications, seminars, multimedia, etc.)

Given the current COVID-19 health crisis, the planned seminars could not go ahead, therefore the only dissemination possible was by publication on the company website.

Project website

<https://escorxador-comarcal-del-moianes-sa.business.site/#summary>

More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): June 2018	Total budget: €197,848.00
Completion date (month-year): September 2020	DARP funding: 78,941.35
Current status: Executed	EU funding: 59,552.25
	Own funding: €59,354.40

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Order ARP/133/2017 of 21 June, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ARP/1868/2017, of 20 June, announcing the call for the grant.



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