

Deliverable DB1.2.1 Prototype validation



This project is financed by the LIFE Programme 2014-2020 of the European Union for the Environment and Climate Action under the project number LIFE19 ENV/ES/000121.
Este proyecto está financiado por el Programa LIFE 2014-2020 de Medio Ambiente y Acción por el Clima de la Unión Europea con referencia LIFE19 ENV/ES/000121.

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1. Introduction

The actions contemplated in the LIFE EGGSHELLENCE project are structured in five groups of actions, being those of type "B" the Implementation actions of the project. This deliverable corresponds to Action B1 "Design of the prototype for the separation of the membrane from the eggshell" and describes the trials performed to confirm the validity of the prototype in the removal of the membrane from the eggshell.

As defined in Deliverable DB1.1.1 the prototype consists of the three following processes (Figure 1, Figure 2):

- ✓ Primary milling with roller mill (1).
- ✓ Sieving (2.6 mm mesh size) in a rotary sieve (2).
- ✓ Secondary milling with roller mill (3).

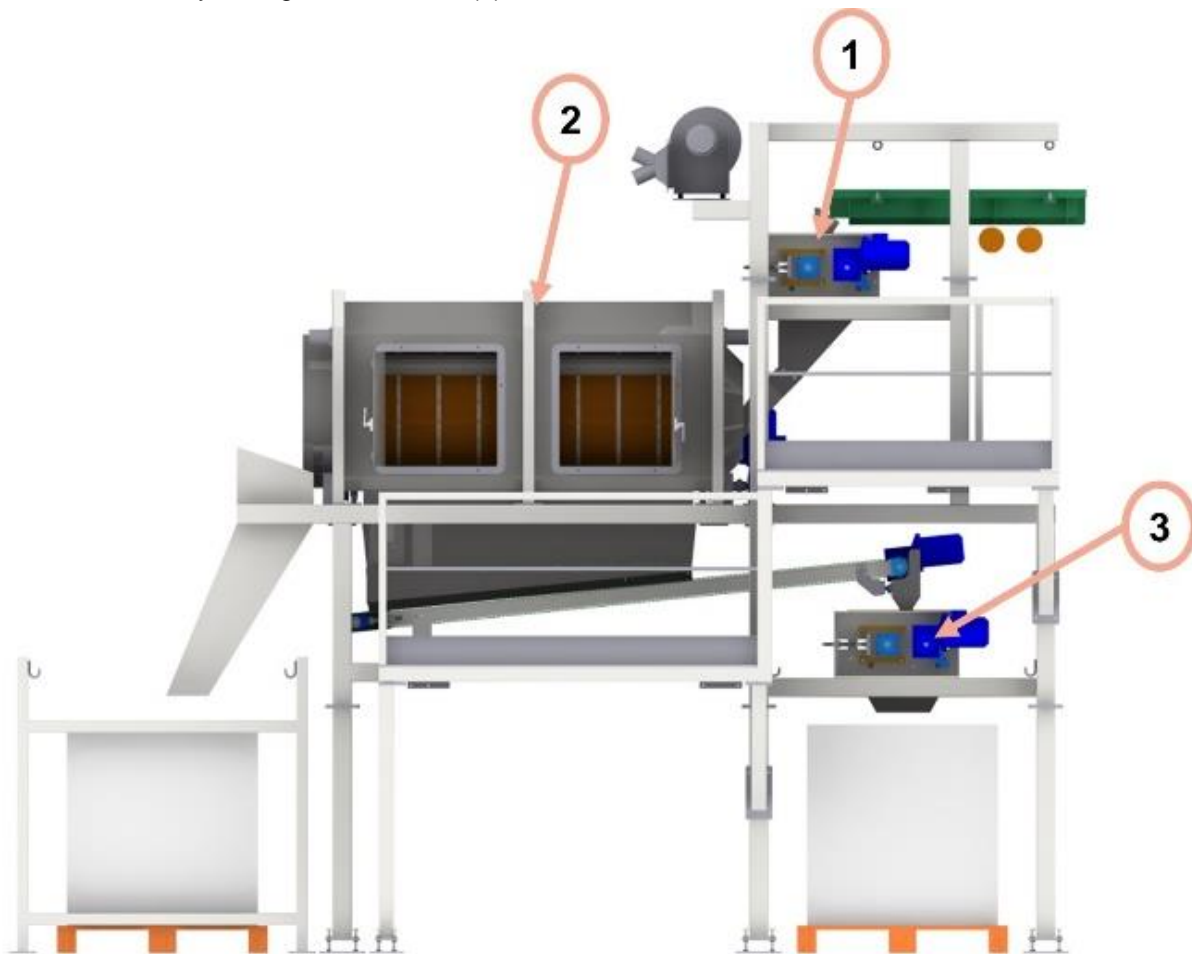


Figure 1. Scheme of the prototype.



Figure 2. Prototype built and installed in AGOTZAINA.

2. Trials

Two trials (each one of 4 hours of production, almost 2 tonnes of eggshell used in each trial) were performed by AGOTZAINA.

The difference between the two trials was that the first one (called 5a because of the use of the same variables as in Trial 5 of **¡Error! No se encuentra el origen de la referencia.**) was done in continuous mode and the second one (5b) was done in periods of 1 hour cleaning the sieve after each period. The results of these two prolonged trials are shown in Table 1 (wet basis).

Table 1 Long trials performed for the validation of process variables.

Trial	Bio-CaCO ₃ obtained (kg)	Membrane obtained (kg)	Bio-CaCO ₃ obtained (wt%)
5a	1140	1235	48
5b	890	1088	45

A similar percentage of bio-CaCO₃ has been obtained in the two trials (even lower in 5b), which indicates that periodic cleaning of the rotary sieve does not increase the yield of the process. This also means that the rotary sieve is not plugged when used for long periods. The small variation obtained can be due to changes in the moisture content or in the feed rate of eggshell waste or even in the type of eggs processed, factors that vary significantly along the time.

In addition, total processing of approximately 2 tonnes of eggshell in 4 hours is equivalent to 12 tonnes/day if the prototype works in a continuous mode, which is higher than typical generation of eggshell in AGOTZAINA (10 tonnes/day).

The characterization of the bio-CaCO₃ obtained in these trials, shown in DB1.2.2, confirms the almost complete absence of membrane in the structure. The bio-CaCO₃ is composed of 94.5% of CaCO₃, 0.7% of MgCO₃, 1.3% of Ca₃(PO₄)₂ and 3.5% of organic matter (with C and N).

These trials confirm the adequacy of the developed prototype for the separation of the membrane from the eggshell as the bio-CaCO₃ obtained is almost free of membrane and it can process total eggshell generation in AGOTZAINA.

3. Conclusions

Once installed the prototype in AGOTZAINA, 2 long trials have been performed. From these trials the following conclusions can be withdrawn:

- ✓ A high removal of the membrane is being achieved with the prototype, even higher than that obtained prior to the construction of the final prototype.
- ✓ On the other hand, there is a lower yield (approximately 50% of recovered material and 50% of discarded membrane with a significant proportion of eggshell adhered, wet basis).
- ✓ The rotary sieve is not plugged when used for long periods.
- ✓ These trials confirm the adequacy of the developed prototype for the separation of the membrane from the eggshell as the bio-CaCO₃ obtained is almost free of membrane and it can process total eggshell generation in AGOTZAINA