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SOLPART

High Temperature Solar-Heated Reactors for Industrial Production of Reactive Particulates

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Deliverable D1.3

WP1 – Assessment of technologies for solar particle processing and storage at high temperature

Deliverable Report on selected technology for high temperature storage of particles and their conveying

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1 Introduction and Objectives

The work in WP1.3 focused on the particle handling technologies. These include particle storage and conveying and general material related aspects, especially dust abatement. Regarding the storage technology, a basic design was selected and first dimensioning activities were carried out. Important design parameters were sizing for a 24h pilot plant operation. Further, aspects like practicability and economics were taken into account. After decarbonation of $CaCO_3$ in the pilot plant, the product needs to be stored, before it can be further treated. Furthermore, the pilot plant needs to provide CaO for a 24h continuous operation. Because of a normal irradiation time of 8h during daytime, the material needs to be stored for further 16h of plant operation in a hot storage, to guarantee the continuous operation.

The selection of the conveying technology was based on previous experience from the Solpart partners. Different types of valves and conveyors are compared and the most suitable ones are selected for the present project.

The importance of dedusting is discussed together with different options to remove dust and reduce its hazardous potential. Also the importance of preventing recarbonation is addressed.

The results shown in this deliverable will be an important basis for a detailed design in Tasks 4.1, 4.3 as well as for the lab-scale activities of Tasks 3.2 and 3.3.

2 Conclusions

This deliverable covers the practical basics that are relevant for the accessory plant components, including the hot storage, particle transportation and dust handling.

Section 2 provides a detailed tentative layout of the hot particle storage. Many design issues are tackled, especially regarding the flowability of the CRM. The general silo shape was chosen to be of rectangular cross-section. It has one vertical wall and three walls at an angle small enough to prevent the occurrence of undesired flow patterns. At the end of the section, some material tests are presented which support the findings of D1.2.

Section 3 covers a range of different particle handling options. All of them are discussed with respect to their applicability in the present project. The findings were already included in the hopper design in Section 2. Moreover, the content of Section 3 will be especially valuable when designing the pilot plant.

Section 4 is focused on the required dedusting. The relevance of dedusting is pointed out prior to the summary discussion of several options to remove particles from gas streams. Due to the small particle size of CRM and the high temperature requirements of the process, the number of relevant options for Solpart is limited. Sintered metal fibre candles are the dedusting system of choice for the high temperature parts, and their introduction into the hot storage silo facilitates the manufacturing and operation.

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