DESIGN AND RESEARCH WORK OF THE SPACETEAM AGH SCIENTIFIC CLUB ON LUNAR TECHNOLOGICAL AND TRANSPORT SYSTEMS K. Najdecki[1], M. Kordas[1], I. Rapa[1], K. Kyć[1], K. Kurek[1], [1]AGH University of Krakow, al. Mickiewicza 30, 30-059 Kraków, Poland, spaceteam@agh.edu.pl

1. Introduction

AGH is a research university with a long-standing tradition in the excavation and transportation of mineral resources. Thanks to its growing involvement in the space sector, the university is part of the UNIVERSEH consortium. The UNIVERSEH SpaceTeam AGH Scientific Club was founded in 2021 and has been developing from the very beginning by working on various projects related to the excavation, transportation, and processing of lunar regolith. It is also participating in the GLEE project created by NASA. Another success of the club was the initiation of the organization of the KGK Space Resources Conference, which has been held annually since 2017.

Figure 1. SpaceTeam AGH team after winning the OTDMC 2023 competition.

2. TOLRECON 2.0

The project involved building a transport conveyor for lunar regolith. The structure was designed for the "Over the Dusty Moon Challenge 2023" competition and required transporting 100 kg of material per hour over a distance of 3 meters vertically and 5 meters horizontally, as well as the preliminary sieving of material into 25 mm fractions. The rod-scraper conveyor used a reciprocating motion to transfer portions of material to a bucket conveyor. This design secured 1st place, winning the competition..

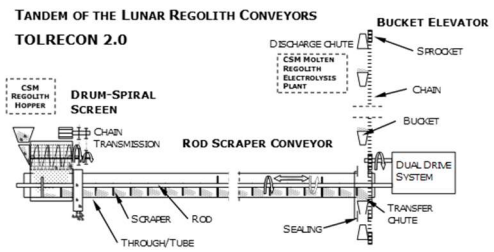

Figure 2. Diagram of TOLRECON 2.0 conveyor

The conveyor was powered by two 200 W solar panels. A specially designed control system allowed it to track the "moving" Sun. This solution enabled operation without an external power source.

3. LUREBUCON 3D

The project enables the efficient transport of lunar regolith even over significant distances. A unique feature of this conveyor is the flexibility of the transport route configuration, as its design allows for the continuous transport of regolith at any angle and in any chosen direction.

4. DISTOBEE

This project involves an excavation-transport machine and a multi-level regolith screener, designed for the ESA Space Resources Challenge "Collection and Processing 2025."

The excavator consists of an excavation tool connected to a screw conveyor, which is mounted on a mobile platform. During transport, the screw conveyor serves as a temporary material storage. The material is then transferred to the screener while the device continues the excavation process.

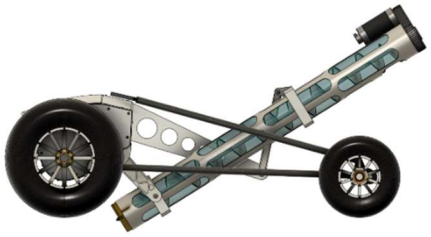

Figure 3. Side view of the mobile excavating and storage platform.

The multi-level screener consists of three sieves with gradations of 1000 µm, 500 µm, and 100 µm. The device is equipped with a system that enhances the sieving and sieve-cleaning process, including vibrating motors that help distribute material evenly across the sieve surface and brushes that assist in sieving and cleaning the sieves of regolith. The transport of unscreened material to an external container is enabled by the cycloidal shape of the brushes and an eccentric motion mechanism.

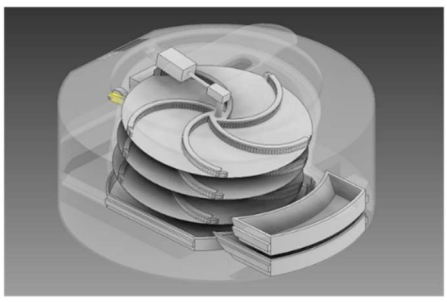

Figure 4. Diagram of the multi-level screener