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DEMONSTRATOR DESIGN FOR LUNAR IN SITU RESOURCE UTILISATION AND OXYGEN PRODUCTION

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The paper discusses the activities currently on going at Politecnico di Milano to design a demonstrator plant for ISRU to extract water from Moon regolith. The Carbothermal reduction (CRB) process, solid-gas based, using methane is here preferred to contain the endothermic reaction temperatures in the range of 950-1000 °C. Former in house experimental activities, demonstrated the mentioned process is cost effective: almost no beneficiation is needed to obtain by far conversion efficiency higher than with other processes such as with hydrogen reduction. The reason why stays in the soil composition the most, being the CRB capable to attack the feedstock silicon oxide, representative of almost 50However, during the methane reduction, the coke formation must be avoided to keep the whole process self-sustainable in the methane re-generation. Therefore, a low pressure reaction is preferred which increases the complexity for the reactor sealing strategy. The design here presented, while ensuring the already demonstrated process efficiency, focuses the more on the whole plant to be the more compliant with a potential inflight operational environment: alternatives on reactor automatic feeding with feedstock and gases, exhausted regolith from the CRB reactor automatic discharge, solid valves design for tight reactor sealing, thermal control to ensure the correct heat exchange at each plant stage are traded-offs and the preferred baseline is critically discussed.

I. MAJOR HEADINGS

Major headings are capitalized, underlined and centred in the column.

Subheadings

Subheadings are underlined and placed flush on the left hand margin of the column.

Sub-subheadings

Sub-subheadings are underlined and indented

II. STYLE GUIDE

II.I Acronyms

Always use the full title followed by the acronym to be used.

II.II References

List and number all the bibliographical references at the end of the full text, in the order of appearance[1].

II.III Equation Numbers

When numbering equations, enclose numbers in brackets and place flush right with the right hand margin of the column.

$$\vec{F}_{12} = -G \cdot \frac{m_1 \cdot m_2}{\left\| \vec{r}_2 - \vec{r}_1 \right\|^2} \cdot \hat{u}_{12} \qquad [1]$$

II.VI Illustrations and Captions

It is important to remember that all artwork, captions, figures, graphs and tables will be reproduced exactly as you submitted them. (**Company logos** and **identification numbers** are not permitted on your illustrations).

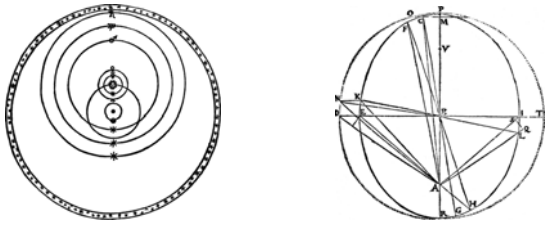

Fig. X: Title of the figure, left justified, subsequent text indented. Place figures at the top or bottom of a column wherever possible, as close as possible to the first references to them in the manuscript. Restrict them to single-column width unless this would make them illegible.

II.V Graph Lines, Drawings and Tables

Use black ink on white manuscript and position to fit within one of the columns on the page, and ensure that they remain still readable.

Tables with a moderate amount of information should be positioned within one column. Tables, graphs or pictures with large amounts of information may extend across two columns.

	Venus	Earth	Mars	Jupiter

M/M_E	0.82	1	0.11	317.89
e	0.007	0.017	0.093	0.048
R (AU)	0.7233	1	1.524	5.203
i (deg)	3.40	0	1.85	1.30
T (years)	0.62	1	1.88	11.86

Table X: Title of table, left justified, subsequent text indented. Heading centred. Do not use vertical lines within the table; use horizontal lines only to separate headings from table entries

II.VI Captions, Graph Axes, Legends

Captions, graph axes, legends, etc. should be large enough to remain readable.

II.VII Footnotes, Symbols and Abbreviations

Footnotes should be cited using symbols in this order: *, t, :t, §, <J[, **, tt, :t:t. Use only standard symbols and abbreviations in text and illustrations.

II.VIII Page Numbers

Indicate page numbering at the bottom of each page.