PRODUCING PROPELLANTS FROM WATER IN LUNAR SOIL USING SOLAR LASERS. A. de Morais Teles[1], [1]Brazilian Center of Physics Research, Rua Dr. Xavier Sigaud, 150, 3º andar, Urca, Rio de Janeiro, RJ, 22290-180, Brasil, Email: antonioamore@yahoo.com .

Introduction: The exploration of the Solar System is directly related to the efficiency of engines designed to explore it, and consequently, to the propulsion techniques, materials and propellants for those engines. With the present day propulsion techniques it is necessary great quantities of propellants to impulse a manned spacecraft to Mars and beyond in the Solar System, which makes these operations financially very expensive because of the costs involved in launching it from planet Earth, due to its high gravity field strength. To solve this problem, it is needed a planetary place with smaller gravity field strength, near to the Earth and with great quantities of substances at the surface necessary for the in-situ production of propellants for spacecrafts. The only place available is Earth's natural satellite the Moon. So, here in this paper, I propose the creation of a Lunar Propellant Manufacturer. It is a robot-spacecraft which can be launched from Earth using an Energia Rocket, and to land on the Moon in an area (principally near to the north pole where it was discovered water molecules ice recently) with great quantities of oxygen and hydrogen (propellants) in the silicate soil, previously observed and mapped by spacecrafts in lunar orbit, for the extraction of those molecules from the soil and the in-situ production of the necessary propellants. The Lunar Propellant Manufacturer (LPM) spacecraft consists of: 1) a landing system with four legs (extendable) and rovers – when the spacecraft touches down, the legs retract in order that two apparatuses, analogue to tractor's wheeled belts parallel sided and below the spacecraft, can touch firmly the ground – it will be necessary for the displacement of the spacecraft to new areas with richer propellants content, when the early place has already exhausted in propellants; 2) a digging machine – a long, resistant extendable arm with an excavator hand, in the outer part of the spacecraft – it will extend itself to the ground, collect soil and retract itself to put the material on the top of the spacecraft inside a hole which will be opened; 3) an infrared laser based on solar electrical energy – a "solar laser" – when the soil be inside the chamber inside the spacecraft, the solar laser will be turned on and it will strike against the soil, heating it up, and release all oxygen and hydrogen from it. The oxygen and hydrogen molecules will be separated from the rest of the material by a mass spectrometer and they will be liquefied by thermal and pressure internal control sub-systems of the spacecraft, and pumped to vessels in a way similar to a micro-industrial line production process; the vessels with the propellants will be then ready to be taken by astronauts, from a small door outside the LPM. The shape of this spacecraft may be conical in order to not unbalance it during the landing and roving maneuvers and soil cargoes, and it will be shielded externally from heat and radiation from the Sun, and micrometeoroids, to prevent the internal thermal conduction and electronic operations from damaging. A solar array externally deployed can produce 44 KW of electric soil energy for the production process. This miniature chemical-processing plant can possibly have an output of 100 Kg of liquid oxygen and 200 Kg of liquid hydrogen per day. Telecommunications with Earth will provide the onboard computer courses for roving to new mapped areas with richer propellants content in the soil. The spacecraft can weight approximately 6,000 Kg (at launch time from Earth). It will be necessary two LPMs for providing all the liquid oxygen and hydrogen needed to supply spacecrafts next to a semi-permanent small manned lunar base. With the Lunar Propellant Manufacturer it will solve the problem of not-expensively producing great quantities of propellants for a manned spacecraft to explore the Moon, Mars and beyond in the Solar System.