POSSIBLE PROMISING WAYS OF USING TERRAFORMING

Nelipovych Sergiy
Student of faculty of chemical technology
National Technical University Of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Shtofel Olha
Assistant of department of general physics and solid state physics
National Technical University Of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Abstract. Mankind’s need of that concept of terraformation has many roots, like deficit of the resources, overpopulation of Earth, curiosity of conquest of the brand new land, and even geopolitical reasons, such as unwillingness of waging war at the near site of themselves. The numbers of scientists and organizations, which work in the field of terraformation technologies are rising rapidly in the last years. By the previous reasons idea of terraformation is very important and actual thing today, but how close is this idea to implementation?

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The term 'terraforming' usually refers to transforming the ecosystems of other planets or moons to make them capable of supporting Earth-like life [1]. Today, Earthlings want to know more about Mars. They want to know about their chances of surviving on Mars and about ways of colonize it. But the looming ecological consequences of what is called the Anthropocene suggest that in the decades to come, we will need to terraform Earth if it is to remain a viable host for Earth-like life.

Humanity has a basic questions in case of the demographic crisis - How many people can our planet really support? Why did the COVID-19 pandemic come? Is the planet being cleansed? Or maybe nature is healing, we are a virus? Some answers can be found in the works [2, 3]. But humanity wants to reinsure and prepare another planet for life. Terraforming Mars means that it must be made suitable for life, similar to the Earth - to modify the atmosphere, temperature, surface topography, ecology of the planet.

It all starts with a dream, and in this case with a science fiction novel by Jack Williamson in 1942. Every dream must be realized and now scientists have already theorized the ways of terraformation of Mars – here are some stages: biological impact (pic.1), method of bringing in the simple plants in purpose of raising the oxygen level (Pic.2) [4]. This way of terraforming requires rather time than sheer technology instruments [5].

Pic.1. First steps of Mars terraformation
Other methods to terraforming Mars: albedo lowering [6] with using the black dust from Deimos and Phobos [7]; placing a magnetic dipole field between the planet and the Sun to protect it from high-energy solar particles [8] - the shield may allow the planet to restore its atmosphere; more extreme method for greenhousing Mars - hurling large, icy asteroids containing ammonia at the red planet would produce tons of greenhouse gases and water [9].

All this ways are perspective and might lead to success in terraforming of Mars, but required technologies in many parts of process, such as the engines that could deliver crews and instruments to the planet a lot quicker than it we have now (roughly 8 month of flight in one direction must be cut to 1 month at minimum). Such engines was already proposed, and in article «New engine tech that could get us to Mars faster» in BBC News by Mary-Ann Russon [10].

The idea that there is an internal balance in nature (or that, left to its own devices, it returns to a state of equilibrium) has been around for a long time and for many years it made sense, as, in times previous to techno-scientific development, the only major changes that we could perceive were cyclical, like one season giving way to the next. This idea was, however, abandoned long before the end of the last century for its idealistic overtones and its inaccuracy in describing what is, actually, chaos or perpetual dynamic turmoil: ecosystems are regularly destabilized in the absence of human influence, and even the world’s remaining “wild” parts are constantly changing [11].

In this article have been described fundamental problem of ongoing climate crisis, caused by humanity: in order to survive, nature needs human’s help. Sadly, direction of tech progress in last 2 centuries led to natural disaster, which already has a terrible influence both on the virgin forests and crowded cities. So the most effective way of this problem is the planetary engineering that must lead to minimal damage to nature with effective use of it, without destroying forests and make species disappear. One of the possible options is proposed in the mentioned article. It is idea of using nanotechnologies to make possible of manipulating matter at atomic and molecular levels, leading to increased effectiveness and lower usage of fuel at all stages of industry. This proposal is very perspective, making possible many other ideas of past real, such as genetic treatment, and acquirement of especial materials etc.

Thus, the analysis of materials [12] and the literature review prompted the consideration of the option of terraforming different planets using the Dyson sphere.
(theoretical megastructure proposed by Freeman Dyson). This concept of extracting all energy of a star has limitless possible ways of using, such as providing Earth or other planet with uncountable amounts of energy as main option. It is interesting to complete the construction of this structure, however, in the Solar system. This concept offers the main side of the energy source, but it can be another way to use it - some planets the size and gravity of the Earth are located near very hot stars, making planet inhabitable by high temperature on surface.

Thus, perhaps the use of a Dyson sphere can help change the temperature of the planet to Earth level by reducing and absorbing star’s radiation, with some changes in structure of sphere. This would provide us with planet ready for colonizing with a relatively little work to do.

Technologies required for that are not so impossible even for modern science. To build that kind of structure, we need tremendous amount of satellites around the star working as concentrators and reflectors of light to the distribution centers, an object of planet size to disassemble for materials, and equipment for massive space launches. Process of building could start with a small factory of satellites and drilling rigs with a little number of human to control the process, and after the beginning of producing first satellite unit, expansion over planet would become much faster, with additional energy source. The main problems in that idea are absence of engine with the speed of light and supply of human crew, but we suppose, that in next 100 years both problems will be resolved. But even started, project of that scale would take a minimum of few decades, so this is only about time to achieve, resulting in resolving issues of energy source for subsequent colonization and terraforming of planet.

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