

Thesis Portfolio

**Design of an In-Situ Fuel, Oxygen, and Potable Water Supply System on
Manned Mars Missions**

(Technical Report)

**The Impact of Surveillance Technology on Women in Contemporary East
Asia**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

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Spring, 2020

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Sociotechnical Synthesis

Design of an In-Situ Fuel, Oxygen, and Potable Water Supply System on Manned Mars Missions

In-Situ Resource Utilization (ISRU) can negate the costs of shipping hydrogen, oxygen, and potable water to Mars. Following current NASA goals, we propose a Martian ISRU system of unit operations to produce these resources and replace shipments from Earth. Oxygen and water production meet the life-support demands of ten colonists for one and a half year-long cycles, and the hydrogen and oxygen fuel are sufficient for a return trip to Earth. Our plant is expected to run for 18 years or 12 cycles. The system was modelled using Aspen Plus simulations combined with detailed reactor, separator, and ancillary equipment designs.

This capstone design project consists of a continuous process that utilizes available Martian resources for production of outputs in an energy-efficient way. Hydrogen is produced through the water-gas shift reaction, which also produces carbon dioxide that can be recycled to increase hydrogen production. MOXIE generates the necessary oxygen for the colony; it relies on a carbon dioxide reduction reaction. Water is mined from the ground as ice, melted, and desalinated through evaporation. NASA's Kilopower technology is used to power the process and the equipment that extracts materials from the atmosphere and regolith. A process flow diagram can be seen in Figure 1 below.

The Impact of Surveillance Technology on Women in Contemporary East Asia

One of the current ubiquitous technological issues in South Korea is the practice of using *molka*, or hidden cameras, in places such as public restrooms, motels, and private homes. These pieces of technology have been violating South Korean women's privacy in their personal and even sexual moments. *Molka* are aided by the quickness and omnipresence of South Korean internet connectivity; it might be the best in the world ("Internet in South Korea," 2020). Given that China and Japan have also undergone rapid economic development and technological advancement in the past fifty years just like South Korea, it is not surprising that they also experience issues related to the universality and pervasiveness of surveillance technology. For instance, *molka* have been found in ladies' restrooms at Seikei University in Tokyo. Although *molka* are not in the public eye in Japan as often as in South Korea nowadays, various relatives and friends living in Japan are cognizant that *molka* are definitely found in Japan, especially in public toilets (Conversation).

On the other hand, China does not appear to have a very obvious problem with *molka* like South Korea or Japan. Instead, there have been cases of the Chinese government exploiting commonplace CCTV for facial recognition of their citizens, perhaps even targeting non-Han Chinese minority groups like the Uighurs (Wee & Mozur, 2019). This suggests that surveillance technologies can be manipulated in different ways by different actors depending on the unethical natures and nefarious interests of the perpetrators.

My research question is: *How can surveillance technology target young women in contemporary East Asia? Why does this occur?*

The pervasiveness of *molka* has made certain places unsafe for South Korean women, such as public restrooms, motels, and private homes. Aided by the internet, these spy cams have

captured many women (and men) in their private and intimate moments and are normally not taken down regardless of sentencing. Their prevalence is a result of a network of actors that indirectly supports criminals, a “pressure cooker” culture that is intolerant of difference and individualism, and discontentment with life that normalizes behaviors that are generally considered immoral. Any hopes of amelioration call for stronger small camera regulations, harsher punishments for criminals (tied hand in hand with more government cooperation), and education geared at changing cultural attitudes and mindsets.