

Soap bubbles inspire new software making mining more cost-effective

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Using an algorithm based on the physical properties of soap bubbles, researchers at the University of Melbourne have developed software to solve operational issues in designing open-pit mines.

Through the start-up company Thinking Mine Design, mathematician Professor Hyam Rubinstein and [mining](#) engineer Dr. Juan Luis Yarmuch developed the Bubble Pit software to address the long-held problem on how best to design mining pits to maximize value and satisfy operational needs.

Key ideas for this project were developed during Dr. Yarmuch's University of Melbourne Ph.D., co-supervised by Professor Rubinstein.

Professor Rubinstein, from the School of Mathematics and Statistics at the University of Melbourne, explained that the mining industry faces many complex challenges and companies have been investing heavily in finding solutions to make mining more cost-effective.

Open-pit mines are built through a series of nested pits, known as pushbacks, leading to the easily recognizable terraced pits found in mines throughout the world.

"Open-pit mining is the most common method used for near surface ore deposits and incorporating the operational constraints of the shapes of the pits into the [design process](#) has been a problem the industry has been trying to solve for decades," Professor Rubinstein said.

"Our software uses a proven [mathematical model](#) to potentially revolutionize the way pushbacks are designed, by using the geometric properties of masses of soap bubbles to find the optimal design shape for the nested pits."

"Our bubble model allows miners to optimize production from the pushbacks, using clusters of nested bubble pits providing connectivity and requisite minimum operational width to the working areas and increasing the efficiency of ore extraction."

After receiving a grant through AMIRA Global, the Bubble Pit software was completed in July 2021. It is currently being trialed in Australia's Newcrest Mining, and the world's largest gold mining company, Newmont.

The team are now looking at two additional software phases exploring how the bubble model can address scheduling and haulage. Newmont and Newcrest have agreed to sponsor the further development based on the success of the Bubble Pit software.

"Scheduling and haulage are hot topics in mining. When the upfront investment in establishing large mines is so significant you want to maximize the efficiency of scheduling and hauling material—and we're using the bubble principles to develop software to make these more effective," Professor Rubenstein said.

"The mining industry is facing costs pressures due to lower ore grades and more difficult locations for mining, so improving efficiency is key to success."

The background Intellectual Property (IP) is owned by the University of Melbourne through a patent and Thinking Mine Design has an exclusive agreement with the University of Melbourne for commercialisation of the IP.

The Bubble Pit [software](#) will be released to the global [mining industry](#) at the end of 2022.

Provided by University of Melbourne

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