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Processing Marcasite Copper Ore With Iron Depressant, Hybrid Reagents, Advanced Data Analytics, Visiofroth™ and Breakthrough Expert Control of Entire Flotation Plant—Fundamentally Transforming Doe Run Buick Mill to Create Value and Expand Ore Resources

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ABSTRACT

The Doe Run Company (Doe Run), a global supplier of lead, copper and zinc concentrates, and lead metal alloys, has deployed an innovative hybrid reagent system which includes an iron depressant to enable processing of high iron marcasite ores at the company's Buick Mill. The deployment of this technology has increased the ability to produce saleable concentrates from high iron marcasite ore, thereby improving ore reserves. This system utilizes VisioFroth™ as a baseline and builds on its platform with a breakthrough expert control system to operate the entire flotation plant using VisioFroth™ as a soft sensor like x-ray fluorescence spectrometry (XRF) and its bubble characteristics as process parameters. This new deployment of technology utilizing Distributed Control System (DCS) as its engine, Pi software as its data hub and a second modern floatation reagent system has been finetuned with advanced data analytics and Machine Learning (ML) for limitless optimization of the mill's operation. It has been deployed at existing mill infrastructure, fundamentally transforming Buick Mill.

INTRODUCTION

The Doe Run Company (Doe Run) is a global supplier of lead (Pb), zinc (Zn), and copper (Cu) concentrates, along with Pb metal alloys. Doe Run's Buick Mill is one of Doe Run's four concentrators in southeast Missouri. All four mills produce Pb/Zn/Cu concentrates from mining and milling metal sulfide ores utilizing conventional flotation, with primary galena and secondary sphalerite and chalcopyrite minerals. All four mills also make copper concentrates from copper ores in separate operational campaigns called Copper Specials by converting lead and zinc circuits into copper circuits. Iron sulfides in ores exist in pyrite and marcasite but historically all mills process pyrite ores not marcasite ores due to very problematic hard-to-depress marcasite, a highly active iron sulfide compared to pyrite.

Buick mill processes ores with rapidly varying lead, zinc, and copper grades from three surrounding mines, and there are extensive marcasite ores. Buick Mill refrained in the past from processing marcasite ores when possible. Marcasite naturally floats very easily, acts out while floating, and severely disrupts separations in all lead, zinc, and copper circuits, making it uneconomical, or much less economical to process than other pyrite ores. There are however a lot of high lead high copper marcasite ores accessible for mining, motivating the development of a comprehensive technology system at mill operational level and on the production line, based on fundamental principles and advanced data analytics. Such a system would most efficiently process not only marcasite ores but also the complex and changing regular ores at Buick mill and other mills as

well. Since marcasite lead and copper ores are believed to be most challenging to process, the system can then help expand other ore resources like high iron high zinc ores and copper ore resources.

Chemical reagents play dominant roles in flotation and can be implemented at a lower cost comparing to upgrading process equipment and production infrastructures. It became apparent that first and foremost an effective iron depressant must be found to depress marcasite, and for that matter pyrite as well. Through searching this iron depressant, a new 2nd modern flotation reagent system could be established which would complement and enhance the current century old and proven bulk reagents. The 2nd reagent system at minimum would consist of one collector and one depressant for each lead, zinc, and copper circuit. Doe Run therefore started working with Solvay to screen its vast commercial reagents to identify these reagents for comprehensive plant trial to build the 2nd Solvay modern reagent system and placed it in DCS for automatic intelligent control. In 2022, a hybrid reagent system was designed for and deployed at Buick Mill, consisting of highly targeted, selective collectors and depressants for each stage of the process. The most vital of these reagents is a powerful and selective iron depressant which can suppress marcasite and pyrite as well. With traditional reagents alone, it is very difficult to control where marcasite will go in the flotation circuit, making the production of saleable concentrates difficult or impossible while it is present. While most of the iron-bearing gangue processed at Buick Mill is pyrite, there are large reserves of ores with considerable lead and copper content which are rich in marcasite as well. Thus, the addition of an iron depressant which can reject marcasite from the process enables the economical processing of marcasite ores with a considerable amount of additional ore value.

Expert control is another proven low-cost approach especially for Buick mill previously without advanced process control (APC) beyond DCS. With foresight a few years prior, Doe Run already piloted 2 VisioFroth™ cameras on the zinc rougher line at its Brushy Creek mill. Around the time Buick mill started seeking fundamental solutions to process marcasite high lead high copper ores in early 2022, Doe Run implemented VisoFroth™ cameras first at the zinc rougher and cleaner lines at Buick mill, even if still at a deep learning curve, and immediately after early success, at copper rougher and cleaner lines as well. So, VisioFroth™ and OCS-4D© that powers and controls VisioFroth™ were vigorously examined and OCS-4D© was chosen as a great platform to develop into intelligent digital expert flotation control system.

Advanced data analytics plays an ever more essential role in mill optimization and can be at a very low cost. Doe Run was implementing PI System across all its mills at the time, very timely providing vast mill data including bulk and new reagents, the quantitative VisioFroth™ bubble characteristics and online XRF assays for all lead, zinc, and copper circuits. Buick mill started very comprehensive advanced mill data modeling that contributed to developing effective expert flotation that overtook and automatically run the entire zinc and copper flotation circuits and 2nd modern reagent system in late 2022, a breakthrough. Buick then installed cameras on lead rougher and cleaner lines and expert controlled the entire flotation plant of all three lead, zinc, and copper circuits in May 2023, automatically removing froth to reach target rougher and final concentrate grades even with rapidly varying ore lead, zinc and copper grades.

Doe Run and Buick mill collaborated very closely with Metso to develop a comprehensive and ever-expanding enterprise mill expert control and operating system, rightly named Digital One on the production line that includes and utilizes DCS, VisioFroth™, XRF, modern and bulk regents, air and MIBC, no limits once inside DCS. Buick mill with Digital One expert control has processed over 200,000 tons of marcasite lead and copper ores and made salable concentrates and strives to expand ore resources and create significant value.

Buick mill extensively examined and investigated various mill control methods and philosophies, including but are not limited to Digital Twin, AI, Advanced Process Control (APC) and Model Prediction Control (MPC).

APPLICATIONS OF VISIOFROTH™

Buick Mill adopted and applied VisioFroth™ gradually with milestones achieved in several phases, a profound operational culture change. First, operators could see and started as a reference to use the velocity of froth moving out of flotation cells, visually and intuitively instead of using other references or non-visual froth depth in DCS. This was a “sea change” and a major milestone. Second, operators could manually input froth velocity setpoint and VisioFroth™ reached the setpoint and operators would adjust the velocity manually and frequently from time to time, the “cruise control.” Third, VisioFroth™ took over and adjusted froth velocity to reach the target rougher and final concentrate grades, completing the “culture change” for the operators.

The expert control system at Buick Mill is built on top of the VisioFroth™ technology. By expanding on

capabilities and scope of the VisioFroth™ system, integrating it into every aspect of the plant, we have developed a robust expert control system capable of automatically operating the entire plant. This system is based on a handful of fundamental principles and finetuned by advanced data analytics and machine learning.

ADVANCED DATA ANALYTICS

A Foundation to Develop Digital One Expert Control and Operating System

Advanced statistical and mathematical data modelling played critical roles, randomly or systematically conducted on various data sources from dynamic lab flotation tests to large datasets from PI System. It's a foundation to be able to develop expert flotation control and especially the Digital One Enterprise Expert Control and Operating System. Numerous data models generated using multivariant response surface modeling are all statistically significant using different set of process variables, reagents, air and MIBC, and quantitative VisioFroth™ bubble characteristics. The large commercial and industrial flotation plant at Buick mill, as complex as it is, or as stochastic as it appears, is thought, and believed to be, indeed follows fundamental laws, very strongly and persistently, meaning thermodynamic and kinetic not just statistical and mathematical. So, flotation is pseudo-stochastic, and we can fundamentally influence, guide, direct, improve and optimize it from so many directions, of course specifically from using VisoFroth bubbles, air and MIBC, modern and bulk flotation reagents, and XRF online readings. Therefore, a comprehensive enterprise expert flotation control and operating system like Digital One is fundamentally certain, can be developed and found, vastly expandable and by nature can be very stable and very robust.

The individual controls for the expert control system were developed not just because they are the obvious ones, but because rigorous analysis of available data indicated that they would be appropriately effective ones. Similarly, the appropriateness of a control remaining in the expert system is determined by aggressively ensuring that it improves the overall system performance.

The kinetics of the hybrid reagents were found to be very clear during plant trial. The flotation kinetics in the presence of the hybrid reagents were found to be very well fit by first order kinetic models, with clear selectivity and effect towards the appropriate minerals.

This is also a large part of why it is possible to run these reagents in the basic mode with just on/off controls. The behavior of the reagents is well-behaved over the dosages which the basic mode runs them at, and their influence is sufficient at those minimum dosages to impact the targeted minerals significantly but appropriately.

Similarly, strong indicator variables such as bubble texture being used to indicate mineral loading is similarly supported by statistical methods.

Plant and circuit data analysis is made possible via the PI data hub which automatically records all major process parameters, including VisioFroth™ bubble characteristics, a large dataset from 19 cameras, during the operation of Buick Mill.

HYBRID REAGENT SYSTEM

Analysis and modeling of a large campaign of dynamic lab flotation tests on Buick ores invariably revealed first order flotation kinetics, with all model parameters statistically significant for each test. This provides the confidence of using two-level flotation dosing tests to screen 11 commercially proven Solvay reagents, otherwise requiring many dozens of tests even by today's most efficient computerized custom Design of Experiments.

The hybrid reagent system consists of five additional Solvay collectors and depressants selected from screening flotation tests that support the bulk chemicals when processing complex ores. These five reagents allow for the flotation circuits to be finetuned as needed. The reagents roles are, as follows:

1. Iron depressant: Primarily to suppress marcasite; also supports cyanide, starch, and lime in suppressing pyrite as necessary.
2. Pb collector: To improve Pb recovery when it is not floating sufficiently in the bulk concentrate, which equivalently reduces Pb present in the Zn concentrate.
3. Pb depressant: To improve Pb recovery in the Cu circuit, where Cu is floated away from the Pb to separate the two concentrates.
4. Cu collector: To improve Cu recovery in the bulk concentrate which feeds into the Cu circuit and planned to improve recovery of the Cu in the Cu scavenger circuit.
5. Zn collector: To improve Zn recovery in the Zn circuit.

All these reagents are quite potent, with typical dosing rates being on the order of 2–20 cc/ton of mill feed. Due to the sensitivity of the system to these reagents, it is relatively easy to overdose any of them while using them manually. Automatic control of these reagents thus greatly increases their effectiveness and reduces costs as well.

The most important of these reagents is the iron depressant, which enables the processing of iron-rich marcasite ores. This has since 2022 allowed for the processing of over 200,000 tons of marcasite high lead and high Cu ores through Buick Mill which otherwise would not have been as economical to process.

The other four reagents allow for finetuning the performance of the float cells as needed to ensure good recovery and the continuous production of saleable concentrates. By placing these under the control of the expert system, it can rapidly respond to variations in feed grade, concentrate quality, or tail assays. Generally, these reagents are added in short bursts to quickly correct for short term variations, while the bulk reagents are used to control the process overall.

All these reagents can be used to reduce the usage of bulk reagents though. Of particular interest here is the iron depressant again, as it can significantly replace the requirement for cyanide in Buick Mill's normal operations especially when processing marcasite ores. The collectors also help supplement the need for xanthate as well.

The iron depressant in the hybrid reagent system has been shown at Buick Mill to be effective in allowing the processing of marcasite ores, but marcasite ores are only sporadically provided to the mill. The other, even more important, side of the breakthrough at Buick Mill is the development and implementation of a groundbreaking expert control system to operate the entirety of the plant, including the hybrid reagent system. With this expert control system, the iron depressant and the other reagents in the hybrid system can be dosed automatically based on automated detection of marcasite ores or other problematic situations in the mill.

DIGITAL ONE ENTERPRISE EXPERT CONTROL SYSTEM EVOLVED FROM VISIOFROTH™

Controlling flotation in full is generally accepted to be a very challenging prospect, as flotation is a widely believed stochastic process, which in return most likely hindered development of such a control system. The process is particularly sensitive to changes in mill feed ore grades especially for multi- metallic ores at Buick mine.

The fundamental outline of the expert control system is guided by the key requirement that it be robust enough to remain online and operational continuously. As a quick overview, the layers of the system are as follows:

1. Field instruments and controllers: The physical devices responsible for providing input and output from the control system to the plant.
2. Distributed Control System (DCS): Aggregates data from the field instruments and adjusts the controllers to maintain operating set point targets.
3. VisioFroth™ System: Receives data from DCS and calculates new operating set point targets for it to control the froth velocity in each flotation circuit. Provides camera bubble data and fundamental software framework for the expert control system.
4. Our Expert Control System: Built in the software OCS-4D that powers VisioFroth™ and utilizing aggregated data from the VisioFroth™ and DCS, adjusts set points for target froth velocities, hybrid reagent dosing, air flowrates and MIBC, and some bulk reagent dosing towards reaching target lead, zinc, and copper rougher and final concentrate grades.
5. PI System: Receives data from all the prior layers, providing a central data hub and enabling advanced data analytics. Also has the capacity to provide soft sensors to the expert control system as needed.

In essence, the DCS layer is ultimately responsible for controlling the plant to the set points requested by operators or by the expert control. The set points provided by the expert system or the VisioFroth™ system are treated as suggestions by the DCS layer and, if necessary, can be overridden by human operators at any time. However, avoiding that be coming necessary is a core objective in the design of the expert system.

The Digital One expert control system as described has been developed for both Rockwell DCS and Emerson Delta V systems at separate mill sites and can be an indispensable enterprise expert control and operating system for both the Doe Run mills and wider industry.

To ensure that human operators are supported by the expert system rather than fighting with it, several key fundamentals are built into the design of the system:

1. Fundamental thermodynamic and kinetic foundations: The decisions which the expert control system is allowed to make are based solely on key flotation principles. These decisions can be supported by data, by years of operator experience, and by theoretical reasoning.
2. Avoiding encoding arbitrary rules of thumb: When asking an operator when they might enable a reagent, they may give specific suggestions such as "when the Pb grade in that stream is over 1.0%." However, an operator's experience and appreciation for context exceeds what can ever be encoded

into a rule of thumb as such. Additionally, such rules of thumb require faith that the target value can be effectively and accurately measured. If sensors drift over time or fail entirely, then they may become inaccurate, useless, or actively harmful.

3. Favor encoding stable controls on stable measurements: In many cases this involves creating optimizing controls instead of on/off controls or PID controls. Especially with X-ray fluorescence values, which are known to drift slightly over time in our operations, it is often preferable to target controls based on how the grade of a given element is changing over time rather than for specific numbers. The drift on the absolute values of any given element reading can become significant, but the drift on the difference between two consecutive measurements of the same element is in our experience generally negligible. Thus, a control which minimizes or maximizes a reading is often more reliable overall than one which responds to a specific target value.
4. Mill operators are always on the driver's seat, can run the whole, any, or no part of Digital One. When operator disengages expert control or optimization to make any setpoint change and back into optimization, expert control follows the new setpoint but limits within 10% change around new setpoint for 30 minutes, honoring but "cross checking" operator's decision.
5. Therefore, always accept operator input: Every setpoint calculated by the expert system can be constrained or guided by the operator as needed, and when the operator changes any of these setpoints the expert control is designed to support the change.
6. Do not rely on forecasts: No matter how successful the system has been thus far flotation is considered a stochastic process for good reason. Any forecasted variable which is critical to the control system will inevitably be forecasted critically incorrectly, and the control system must handle that gracefully.

The ultimate goal of these guidelines is that the system must be able to stay on production line. Equivalently, it must be able to survive the operators, in that they should not find it to be too intrusive or too cumbersome, nor should they need to be overriding it all the time. It should handle problematic local events appropriately, typically by allowing the human operators to address the situation without the expert system's interference.

For specifics, the expert control implemented at Buick Mill is particularly focused towards the detection of problematic marcasite ores and to automatically account for them when they are detected. The primary indicators here are the iron assays in the Pb and Zn concentrate streams. When marcasite (or any unusually high iron) is detected, the iron depressant is enabled and controlled based on the iron grade until the iron is reduced to acceptable levels in the concentrate again.

Similarly, the other hybrid reagents are triggered based on X-ray assay information. The Pb collector is used to reduce the amount of Pb in the Zn concentrate, as that is where it ends being problematic if it does not make it to the bulk concentrate. The Zn collector is added when the Zn in final tails stream is unusually high. The Cu collector is added when the Cu in the Pb concentrate is too high, as the Cu/Pb separation floats the Cu while sinking the Pb. Pb depressant is added when the Pb in the Cu concentrate becomes too high, for the same reasoning. These cutoff values are based on shippable concentrate targets.

The control system for the hybrid reagents has two modes: basic and advanced. In basic mode, these controls are on/off controls with hysteresis. They are enabled when they pass the upper threshold value and are disabled when the target variable is reduced below a lower threshold value. The dosing of the reagents is constant when the reagents are enabled. In advanced mode, the thresholds remain the same but the dosing is exponential feedback controlled to rapidly increase the dosage when the targets are significantly above the threshold values.

The next step in this part of the control system is to utilize techniques from machine learning to optimize the on/off thresholds and dosing targets. This will move the system past simply ensuring concentrate quality is maintained into directly using these reagents to optimize the overall recoveries and plant performance.

The first bulk reagent to be addressed by the expert control system is copper sulfate. Copper sulfate is used in the Zn flotation to activate the Zn minerals (overwhelmingly sphalerite), and the presence of sufficient copper sulfate can be strongly detected based on the bubble size. This is a parameter that is detected by the VisioFroth™ system. Thus, copper sulfate is added when Zn is being lost to the tails, but not if the bubble size is already small and indicative of sufficient copper sulfate being present.

The air and MIBC for each part of the flotation circuit are also controllable. For these the primary parameter is bubble texture, another soft property reported by the VisioFroth™ system. It is used as a reliable indicator of

bubble mineral loading, which in turn is used to tell if the bubbles are being used efficiently for the flotation.

The optimization module is an extension of what would be typically included with the VisioFroth™ system. This module adjusts froth velocity setpoints to reach target concentrate grades, ultimately improving recovery automatically and continually. One of the major challenges facing this system at Buick Mill is that Buick Mill's ore comes from several very distinct underground areas. Thus, several very different ore grades may be present in the mill feed in quick succession, leading to significant swings in availability and presence for each of the minerals during even just a couple of hours. For example, it is not unusual to see the Zn grade in the feed double over the course of 20 minutes before dropping back down to its previous level within an hour or so.

A major challenge is when the target concentrate grade is reached for lead, zinc or copper and "the machine" has done its function as instructed, it does not respond to sudden spikes in ore grade, or slowly when ore grade drops sharply, since the goal of reaching target concentrate grade is already met. Deep machine learning is therefore needed and developed. The major breakthrough allowing the optimization module to function even with these considerable swings is largely possible due to the capabilities of the VisioFroth™ system's software, OCS-4D©. The expert control system registers significant spikes or drops in the feed grade, and if within a certain reasonable time frame a similar spike or drop is seen in froth depth associated with that same element, the velocity setpoint adjustments are accordingly sped up or sharply decreased temporarily to handle the change restoring to froth depth prior to spike or drop in ore grade. This increased responsivity in response to specific predicted conditions has been integral to keeping the optimization module online despite these ore variations.

It is important to note that the delay between the spike or drop being detected and the associated increase in froth depths is not a hard, fixed value. Rather, a spike or sharp drop in feed grade primes the system to detect such a froth depth increase or decrease. Until that change in froth depth, increasing or decreasing, is actually observed by machine, however, the system does not make froth velocity setpoint changes based on it. Not every feed grade change observed by the online X-ray corresponds to a significant quantity of material, as the X-ray only assays the mill feed for about a minute out of every six minutes. Thus, the assay value is not used to forecast an increase in the cell loading, but to indicate the possibility that it may be observed on another sensor (the froth depth, in this case).

There are several future steps enabled by this system. Most importantly, as a purely digital control system, it can transcend the boundaries between traditionally separated unit operations. There is nothing inherent to the system that prevents its application to controlling grinding or filtration. Even more so, there is nothing preventing the system from using sensor data from as an example flotation to make adjustments in the rod mill and ball mill parameters. One application could be that if in flotation all the soft sensors used to detect marcasite are indicating the presence of marcasite, then it would be possible to automatically reduce feed rate to ensure that the minerals in the marcasite ores are liberated.

Buick Mill constant learns about and expands features, functions, and applications of the Digital One expert control and operating system beyond flotation from which it was started and developed. Digital One now consists of "Digital Operator" mimicking operator's best practices; Expert of Things "EoT," Expert Flotation and Expert Grinding. Most importantly, the integrated expert flotation and expert grinding in Digital One leads to flotation control based on applied thermodynamics and kinetics, much needed to process complex ores most efficiently at Buick Mill and the other Doe Run mills and to expand various ore especially copper ore resources. It is currently being tested and applied in different scenarios and being vigorously examined. These developments and the fundamentals supporting the applications are certainly beyond the scope of this article and are subjects of other articles and presentations.

CONCLUSIONS

The expert control system and hybrid reagent system introduced at Buick Mill fundamentally transforms its capabilities. Since the implementation of the control and reagent scheme to handle marcasite ores in 2022, over 200,000 tons of marcasite high lead high copper ores have been processed, making salable concentrates. This is a direct result of these improvements to the reagent scheme and expert control, creating significant value from the mill at minimal expense.

However, the marcasite ores are only one of the highlights of Buick Mill's transformation. The expert control system has managed to be maintained on the production line, achieving operator acceptance while also reaching out to control all aspects of the flotation plant. It is possible and we demonstrate that we can completely take over a flotation plant with safe and robust automation, barring local events requiring operator intervention. Expert flotation control has been running zinc and copper circuits since December

2022, and the lead circuit and entire flotation plant since May 2023 at Buick mill.

Progress is also made to reducing the use of several reagents including xanthate and cyanide, by automatically adding potent and selective reagents and effective iron depressant which can partially replace them. In turn, using these reagents this way is made possible by the expert control system designed around them.

Buick mill has effectively become an advanced commercial flotation laboratory with PI system recording all mill data on all mill's process parameters, reagents, VisioFroth™ bubbles and XRF online assays. All the recorded data of hundreds of variables can be generated "instantly" for any specific period in an ODBC database format for analysis and modeling.

The expert control system provides a powerful environment to further develop the Buick Mill, can effectively audit ores, processes, operations, and instrumentation and maintenance towards continuous improvement. It is already designed around utilizing reagents to control the flotation based on thermodynamic and kinetic fundamentals, meaning that additional reagents can be tested for similar roles with minimal reconfiguration. The system needs little more than to know that the role of a reagent is to, for example, collect Zn to test the reagent to its limit in the plant as a Zn collector.

Deep ML in Digital One expert flotation control detects sharp spikes or drops of lead, zinc and copper grades in mill feed whenever occurring, logs in and remembers process parameters at that moment notably froth depths, then waits until "seeing" froth depths spike or sudden drops to remove froth accordingly to the previous recorded froth depths. This increases expert control run time and metal recoveries instead of operators disengaging optimization and resetting froth velocities and back to expert control. It's a breakthrough, solves a major challenge Buick mill and today's mills face, and can lead to limitless applications of knowledge-based ML on the production line and dynamically. Several such cases and applications are currently on plant trials.

The wholly digital control system means that any aspect of the mill can potentially be built into this system. There are plans to pursue expert grinding and expert filtration controls as well, both of which targeted at reducing operating expenses related to these unit operations while maximizing recovery. It is primarily because of the success we have achieved so far with Digital One that these opportunities are made seen and available.

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Building Our Future Project: Inspiring Young People to Follow Their Dreams and Aspirations

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ABSTRACT

It is our responsibility to promote responsible and sustainable mining with new generations, promoting a culture of equality and respect. To fulfill this commitment, we are working with the SME UNC Student Chapter team, Newmont Yanacocha, BRG Women and Allies and the Museo de Agua y Tierra (MAT) to carry out the "Building our future" project.

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This project seeks to instill in new generations the importance of mining, integrating sustainable development objectives. We have the participation of Newmont Yanacocha and external professionals, who share their life stories and inspire participants from rural and urban educational institutions to pursue their dreams and aspirations.

We believe that this project is important because it will help new generations understand the importance of mining and its role in the development of the country, covering the economic, environmental and social spheres. Since its inception in 2022, the project has positively impacted more than 500 participants.

INTRODUCTION

In this complex and dynamic society that faces socioeconomic, environmental and cultural challenges and problems that directly influence people's lives. In this context, it is essential to explore and understand social problems to effectively address and build a more equitable and sustainable environment. Due to these situations, social projects are carried out that address specific problems or needs within a society (Tavira & Herrera- Tapia, 2016).

Taking a brief tour of some successful social projects where children and adolescents are involved is the Pabellón Minero Infantil that from 2014 to the present has managed to impact 25 thousand primary school students. This project consists of taking a tour of an underground mine, talking about mining, safety standards, glass manufacturing and mineral recognition. (Santoyo, 2023).

Through the achievements obtained by the Pabellón Minero Infantil project, which is part of the inspiration to create the project "Building our future" that aims to change the perspective about mining in the new generations of our region, we being protagonists of mining in Cajamarca observed the need for an educational space for children and adolescents from different educational institutions where they can talk about mining from the experience of successful professionals in the field, through games and other activities according to age promoting a culture of equality and respect in mining.