TAILINGS MINE WASTE 98 pdf

1: Tailings & Waste - Stantec

Welcome to Mine Waste and Tailings AusIMM's Mine Waste and Tailings conference will focus on state-of-the-art developments in global tailings management. Throughout this two-day conference, experts from industry and academia will discuss the integration of innovative approaches to mine design, management and operation in order to.

Mechanical and chemical processes are used to extract the desired product from the run of the mine ore and produce a waste stream known as tailings. The unrecoverable and uneconomic metals, minerals, chemicals, organics and process water are discharged, normally as slurry, to a final storage area commonly known as a Tailings Management Facility TMF or Tailings Storage Facility TSF. Not surprisingly the physical and chemical characteristics of tailings and their methods of handling and storage are of great and growing concern. Tailings are generally stored on the surface either within retaining structures or in the form of piles dry stacks but can also be stored underground in mined out voids by a process commonly referred to as backfill. Backfilling can provide ground and wall support, improve ventilation, provide an alternative to surface tailings storage and prevent subsidence EC Backfilling is discussed in the relevant section which can be accessed here. The challenges associated with tailings storage are ever increasing. Advances in technology allow lower grade ores to be exploited, generating higher volumes of waste that require safe storage. Environmental regulations are also advancing, placing more stringent requirements on the mining industry, particularly with regard to tailings storage practices. This ultimately places added pressure on the operators of a tailings facility who carry out the day to day roles of tailings discharge and water management. The majority of historical tailings related incidents have been influenced by poor day to day management, which has resulted in the strengthening of regulations controlling tailings storage today. The research carried out in the PhD thesis submitted at the University of Leeds in has targeted the management roles to improve day to day operations and reduce the risks associated with surface tailings storage. The parameters that influence the stability, operation and management have been identified and presented together with their methods of control, intervention and mitigation. This is supported by a free novel online database called TailPro www. Tailings are a waste product that has no financial gain to a mineral operator at that particular point in time. Not surprisingly it is usually stored in the most cost effective way possible to meet regulations and site specific factors. Dams, embankments and other types of surface impoundments are by far the most common storage methods used today and remain of primary importance in tailings disposal planning. The particular design of these retaining structures is unique to a particular environment and mineral processing operation. When considering the design of a tailings storage facility there are many parameters which impact on the optimum site selected and the storage and tailings discharge methods used Ritcey The environment and ground conditions are the most crucial parameters that control tailings storage methodology which ultimately affects the way a facility is designed, built, operated and closed. For this reason a range of alternate methods of tailings storage and discharge techniques need to be considered when designing a facility for a particular location. In industry, this is achieved by implementing a trade-off study, usually during the pre-feasibility stage of project development. A selection of options from this study can be taken through to feasibility stage to assess environmental, social, economic and associated risk and operational factors with a higher level of confidence. This page briefly highlights the generation and nature of tailings. The various tailings storage and discharge methods used today are discussed in the relevant sections of this website. The water management considerations discussed are only specific to conventional storage and should highlight why this method is problematic compared to alternative storage techniques that discharge less water to the tailings storage area e. Nature of tailings The process of beneficiation of run of the mine ores and subsequent disposal to surface containment facilities exposes elements to accelerated weathering and can consequently increase their mobilisation rates. The addition of reagents used in mineral processing may also change the chemical characteristics of the processed minerals and therefore the properties of the tailings and waste rock EC The processing of hard rock sulphidic bearing ores is just one example of accelerated weathering. In this case the sulphide minerals more readily oxidise in the tailings facility as a result of the size reduction from milling increasing the surface area and thus exposure of the tailings to air and water. Acid generation and metal mobilisation occur that can find their way into the surrounding environment through runoff or seepage. Depending on the mining project, alternative tailings storage techniques such as sub-aqueous disposal below water deposition , high density thickened tailings or dry stacking can be implemented to control oxidation of sulphides and the mobilisation of metals. Production of tailings The disposal of tailings is commonly identified as the single most important source of environmental impact for many mining operations Vick This is not surprising when considering that the volume of tailings requiring storage can often exceed the in-situ total volume of the ore being mined and processed. Over the last century the volumes of tailings being generated has grown dramatically as the demand for minerals and metals has increased and lower grades of ore are being mined through advances in extraction and processing technology. Today there are individual mines producing in excess of , tonnes of tailings per day. Understanding the mineral processing techniques can help to determine how tailings are produced and the challenges associated with their storage. Run of the mine ore is physically reduced by crushing and grinding methods figure 2. The optimum degree of grinding is determined by the extraction methods used to remove the economic product. A simple mineralogical examination can hold the key to identifying the most advantageous extraction methods to use. The examination can also determine other minerals of economic interest, the type and quantities of reagents required to separate the concentrate from the gangue materials and the necessary storage methods for the tailings Ritcey Pilot plant tests can also be useful to determine optimum particle size, processing reagents required and the final tailings characteristics. However, such pilot tests may not be an exact representative of the tailings that will be produced from the full scale plant. This means that the final design of any tailings facility is always provisional and must be confirmed once tailings production is underway Blight Concentration is the process of extracting the economic product from the crushed and ground ore, the waste from this process is the tailings. Froth flotation figure 2 is the most widely used concentration method and is normally the first step in the mineral processing sequence where chemical reagents are introduced Vick Gravity and magnetic separation techniques are also used to win the economic product from the ground ore. Gravity separation is used in gold processing to recover the coarser particles, the finer being recovered by leaching EC Refractory ores are commonly processed using pressure oxidation, bioleaching and roasting prior to leaching techniques. These types of pre-processing are often associated with ultra fine grinding that generates tailings with slow settling and low in-situ density properties. When designing the processing plant, the types and quantities of reagents used should be considered together with any depressing requirements to lessen environmental impacts in the tailings streams Ritcey Reagents dosed in small quantities are either consumed, retained in the process or are discharged with the tailings. The design of a tailings storage facility should therefore be optimised to prevent weathering and the mobilisation of contaminants, whilst also increase the degradation rates of reagents stored in the tailings facility. Tailings characteristics Tailings characteristics can vary greatly and are dependent on the ore mineralogy together with the physical and chemical processes used to extract the economic product. Ritcey reported that tailings of the same type may possess different mineralogy and therefore will have different physical and chemical characteristics. The tailings characteristics have to be determined to establish the behaviour of the tailings once deposited in their final storage location and the potential short and long term liabilities and environmental impacts. Once the likely characteristics of the tailings are determined from laboratory and pilot plant tests, the necessary design requirements can be identified to mitigate environmental impact as well as determine optimum operational performance. Liberation of water from the tailings once discharged in a facility and the volume available for return pumping to the processing plant is an important design parameter influencing the water balance of a mining project make-up water costs. This liberation is dependent on the physical properties of the tailings deposited and can be estimated through laboratory testing of the tailings at different solids concentrations. This parameter can influence the type of tailings storage method used to prevent discharge of water to a tailings storage area e. To help determine the design requirements of a tailings storage facility, the following characteristics of the tailings will need to be established based on EC Chemical composition including changes to chemistry through mineral processing and its ability to oxidise and mobilise metals Physical composition and stability static and seismic loading Behaviour under pressure and consolidation rates Erosion stability wind and water Settling, drying time and densification behaviour after deposition Hard pan behaviour e. It is therefore essential that while investigating the properties of tailings that the physical characteristics and material parameters e. This is particularly true when considering high density tailings disposal and its associated transportation and deposition challengers. Once the potential site specific parameters e.

2: Tailings and Mine Waste - CRC Press Book

Tailings and mine waste '98 proceedings of the Fifth International Conference on Tailings and Mine Waste '98, Fort Collins, Colorado, USA, January by International Conference on Tailings and.

Test Results The Bureau of Mines surveyed waste disposal sites at 18 metal and non-metal mines and conducted laboratory and full-scale field tests to determine the effects of tailings deposition techniques on physical properties of tailings pond beaches. Survey data included measurements of beach slopes, descriptions of deposition techniques, and measurements of beach physical properties taken at various distances from the point of discharge. Laboratory tests involved depositing two types of tailings, each with different grain-size distributions, into a settling trough and determining the resultant physical properties of settled materials along the length of the beach. Side confinement and the closeness of the water pool to the point of deposition caused the laboratory results to be inconclusive. Full-scale field deposition tests conducted at the tailings pond of a cooperating mine showed that there were similarities in relationships between exit velocities of tailings slurry and physical properties of the settled tailings on the beach. Mill tailings usually are considered a useless byproduct of mining and milling processes. However, mining and milling methods have changed as more low-grade ores are now being mined. As a result, the quantity and quality of mill tailings have also changed. Tailings are ground more finely as ore dressing procedures pick up microscopic particles of minerals, and the ratio of recoverable minerals to waste tailings is decreasing because more lower grade ore is being processed. In an effort to promote safety-oriented technologies for mine waste disposal, the Bureau of Mines has conducted an investigation to determine the effects of deposition techniques on the structural stability of tailings embankments. For example, deposited tailings could be used as a source of backfill material. Presently, particle separators, such as cyclones, are used to gather the sand fraction of tailings for use as hydraulically transported, underground backfill. This practice, however, leaves the fine fraction to be deposited on the surface. If the total tailings could be used as backfill, the need for a large surface disposal area would be minimized. By using mechanical dewaterers or by naturally dewatering the tailings via evaporation and percolation, mill tailings could become a useful source of backfill aggregate. This would be especially true if tailings settling could be controlled at deposition to produce an optimally segregated material that could be reclaimed with a minimum of effort. It might also be possible to determine a relationship between the exit velocity of the tailings slurry and the factor of safety of tailings embankments. This correlation would help personnel to quantify any changes in the embankment factor of safety due to proposed changes in tailings deposition rates. The information produced in this study would be useful also in developing better deposited tailings for use as embankment material. This investigation consisted of three phases. Phase I was a survey of the tailings impoundments of 18 metal and nonmetal mines. The results were evaluated for correlations between deposition and embankment characteristics. Phase II included laboratory model tests where tailings slurry was deposited into a long, narrow settling trough and the physical properties of the resultant beach were measured. Phase III consisted of full-scale field tests at a cooperating mine site where an auxiliary pipeline was installed to control tailings deposition flow rates. The beach formed by each controlled deposition was then analyzed, and its physical properties were measured. The measured physical properties, in conjunction with the relationship between each exit velocity of the discharged tailings slurry and stability of the resulting beach slope, were used to perform an iterative analysis of the factors of safety for an idealized embankment. A few of the deposition techniques used at the mines included upstream spigoting type 1 , centerline cycloning type 2 , and borrow dike with spigoting type 3. Elevation surveys were conducted to determine beach slope, and distances were measured between sample locations where surface Shelby tube samples were taken perpendicular to the embankment crest. This measurement and sampling pattern produced a cross section of physical properties with respect to distance from the point of discharge. Table 1 summarizes the tailings impoundment characteristics at the 18 mine sites. A stepwise regression analysis was used to pick the most highly correlated variables in descending order of correlation, thereby builing a linear mathematical model of the selected input variables. A set of products and squared terms were also candidates for the model.

An important constraint was that the model be linear and additive. Therefore, many other candidate functions were not investigated, for example, exponential curves. Figure 2 shows a tabulation of one stepwise regression analysis. In this case, variables 1 to 3, the multiples of variables 1 to 3, and the squares of variables 1 to 3 were used to predict the grain-size distribution of the beach i. As figure 2 indicates, there is a poor linear correlation between any one of the predictive variables and the grain-size values. This usually indicates that a highly correlated result will not be obtained even if many of the variables are included in the final mathematical equation. Four groups of statistical analyses were performed. Table 2 provides descriptions of the analyses and summarizes the results. The results indicate that the data from the 18 mine sites are far too heterogeneous to be treated as a single data set. The only good regression run was for code C table 2 , using only data obtained from type 1 depositional methods where embankments were built by upstream spigoting. The tailings were diluted with water to a specific slurry density, mixed in a large, 1,gal tank, and then pumped at a specified flow rate for discharge into a settling trough. Tailings A consisted of fine mill waste from a copper-silver mine. Tailings B was from a silver-lead-zinc mine and contained coarser particles. The grain-size distributions are plotted in figure 3. It was hypothesized that depositional variables such as flow rate, slurry density, and beach physical properties, as well as relationships among variables, could be ranked according to their relative importance before full-scale field tests were undertaken. For each tailings sample, the slurry density was altered by changing the percentage of solids. A burlap bulkhead at the far end permitted the water to drain. After the solids were sufficiently dewatered, Shelby tube samples were taken at designated distances along the length of the deposited tailings. The samples were then analyzed for permeability, internal shear strength, and grain size. Figures 4 through 6 show the bulk mixing tank, slurry loop system, and deposition of the tailings to form the beach. Test Results Tables 3 and 4 summarize the physical properties of the deposited tailings from mines A and B. The data in these tables indicate that the following relationships among the variables are valid: The relatively small change in beach slope after the change in slurry density in comparison with that of the mine. A sample can be attributed to the higher specific gravity of the mine B tailings sample 2. Although the two completed tests verified generalized relationships, no quantitative correlations could be seen. Apparently, the confined dimensions of the trough influenced the depositional trials. Side eddies and the closeness of the pond water to the point of discharge obscured any attempt to correlate tailings deposition conditions to resultant beach characteristics. Therefore, it was necessary to conduct full-scale field tests without the benefit of quantitative laboratory results. The mine provided access to its tailings, a site at its pond on which to build an auxiliary tailings discharge spigot fig. Figure 8 shows the auxiliary spigot arrangement that controlled the flow of tailings. The spray plate was used to determine if an energy dissipator would significantly alter the physical properties of the beach. After the data were compiled, an idealized embankment was modeled using the physical properties of the beaches generated at each depositional velocity. The computer model simulated a 1. The beach slopes and physical properties were changed for each computer run of slope stability to reflect each beach condition found after full-scale deposition. The slip circle was held constant to maintain a through-the-embankment-face arc figure 10, table 5. Test Results The results of the full-scale field tests are summarized in figure 11 and table 6. The beach slopes, sample locations, and physical properties were listed for each depositional velocity designated by A, B, C, D, and E. From these sample cross sections, the data were plotted to determine relationships among the variables. The data indicate the following: Dry density did not significantly change for distances greater than ft from the point of deposition regardless of tailings exit velocity fig. When the spray plate dissipator was used, the dry density increased after ft, but decreased when the distance was less than ft from the point of deposition fig. The beach that formed when the spray pldte dissipator was used was flatter than the spigot-formed beach at all distances from the point of discharge fig. At all the velocities studied, the beach slopes were progressively flatter with increased distance from the point of discharge fig. Discussion of Results This Bureau study analyzed surface tailings deposition characteristics using three types of data gathering techniques. Phase I consisted of random sampling at 18 different surface waste disposal sites. Phase II used a ft-long trough into which two tailings types were deposited at controlled velocities and slurry densities. Phase III required building an auxiliary pipeline on an active tailings pond and controlling the exit velocities of the mill tailings. For all three types of deposition tests, engineering properties were determined for the resulting beaches. These properties were then analyzed to determine if relationships existed between the depositional variables flow rate, slurry density, etc. The statistical analysis of the data collected from the phase I field survey of 18 mine sites was inconclusive. Too many different types of depositional techniques were analyzed together to determine individual nuances. For instance, the largest family of depositional typeâ€”upstream spigotingâ€”contained six mine sites for consideration. Of these six sites, each exhibited individual differences that may have affected the survey differently, i. Two-dimensional correlation coefficients r were computed for two reasons: Table 7 summarizes the correlation coefficient matrix for the up-stream spigot sites only. Phase II laboratory trough tests indicated that there were even fewer linear relationships between the variables table 8. Boundary condition constraints seem to have influenced the tailings depositions. For example, the wooden settling trough was apparently too short and narrow, creating back eddies and premature settling of fines. The correlation coefficients of 1. The relationships were paired because the material properties were compared to themselves since the same mill source was reflected. The results of the phase III full-scale field trials are promising, but not complete. The tailings used in the study had a very fine grain size, which did not readily yield definitive differences in material properties. However, because of the fine grain size, the tailings can be taken as the lower limit of a range of tailings sample sizes where the measurements of physical properties also provide limiting values. The correlation coefficient matrix for the tests is summarized in table 9. The strongly paired correlations were as follows: As the exit velocity decreases, the ensuing beach velocity also decreases, causing particles to settle at a faster rate, thus creating a steeper beach. An increase in the beach slope angle is related to slowed beach velocity, which in turn causes faster settling of tailings particles.

3: Tailings - Wikipedia

Tailings and Mine Waste '18 is a continuum of a series of symposia on mill tailings management that originally started at Colorado State University in and subsequently progressed as the annual Tailings and Mine Waste Conferences through

Bauxite tailings near Stade Germany Bauxite tailings is a waste product generated in the industrial production of aluminium. Making provision for the approximately 77 million tons that is produced annually is one of the most significant problems for the aluminium mining industry. On average, worldwide, there is one big accident involving a tailings dam each year. See also List of tailings dam failures. Storage methods[edit] Historically, tailings were disposed of in the most convenient manner, such as in downstream running water or down drains. Because of concerns about these sediments in the water and other issues, tailings ponds came into use. The sustainability challenge in the management of tailings and waste rock is to dispose of material, such that it is inert or, if not, stable and contained, to minimise water and energy inputs and the surface footprint of wastes and to move toward finding alternate uses. Tailings dam Bounded by impoundments an impoundment is a dam , these dams typically use "local materials" including the tailings themselves, and may be considered embankment dams. The modern tailings designer has a range of tailings products to choose from depending upon how much water is removed from the slurry prior to discharge. The removal of water not only can create a better storage system in some cases e. In a description of tailings impoundments, however, the U. EPA stated that dewatering methods may be prohibitively expensive except in special circumstances. The ponds were constructed to contain a spill created by EPA workers, while trying to install a cleanup system on the main tailing pond for the long closed mine. Tailing ponds are areas of refused mining tailings where the waterborne refuse material is pumped into a pond to allow the sedimentation meaning separation of solids from the water. The pond is generally impounded with a dam, and known as tailings impoundments or tailings dams. Tailing ponds are often somewhat dangerous because they attract wildlife such as waterfowl or caribou as they appear to be a natural pond, but they can be highly toxic and harmful to the health of these animals. Tailings ponds are used to store the waste made from separating minerals from rocks, or the slurry produced from tar sands mining. Tailings are sometimes mixed with other materials such as bentonite to form a thicker slurry that slows the release of impacted water to the environment. There are many different subsets of this method, including valley impoundments, ring dikes, in-pit impoundments, and specially dug pits. Exhausted open pit mines may be refilled with tailings. In all instances, due consideration must be made to contamination of the underlying water table, amongst other issues. Dewatering is an important part of pond storage, as the tailings are added to the storage facility the water is removed - usually by draining into decant tower structures. The water removed can thus be reused in the processing cycle. Once a storage facility is filled and completed, the surface can be covered with topsoil and revegetation commenced. However, unless a non-permeable capping method is used, water that infiltrates into the storage facility will have to be continually pumped out into the future. Paste tailings[edit] Paste tailings is a modification to the conventional methods of disposal of tailings pond storage. In paste tailings the percent of solids in the tailings slurry is increased through the use of paste thickeners to produce a product where the minimal separation of water and solids occurs and the material is deposited into a storage area as a paste with a consistency somewhat like toothpaste. Paste tailings has the advantage that more water is recycled in the processing plant and therefore the process is more water efficient than conventional tailings and there is a lower potential for seepage. However the cost of the thickening is generally higher than for conventional tailings and the pumping costs for the paste are also normally higher than for conventional tailings as positive displacement pumps are normally required to transport the tailings from the processing plant to the storage area. There is a growing use of the practice of dewatering tailings using vacuum or pressure filters so the tailings can then be stacked. However although there are potential merits to dry stacked tailings these systems are often cost prohibitive due to increased capital cost to purchase and install the filter systems and the increase in operating costs generally associated electricity consumption and consumables such as filter cloth of such systems. Storage in underground workings[edit] While disposal into exhausted open pits is generally a straightforward operation, disposal into underground voids is more complex. A common modern approach is to mix a certain quantity of tailings with waste aggregate and cement, creating a product that can be used to backfill underground voids and stopes. HDPF is a more expensive method of tailings disposal than pond storage, however it has many other benefits â€” not just environmental but it can significantly increase the stability of underground excavations by providing a means for ground stress to be transmitted across voids - rather than having to pass around them â€” which can cause mining induced seismic events like that suffered previously at the Beaconsfield Mine Disaster. In most environments, not a particularly environmentally sound practice, it has seen significant utilisation in the past, leading to such spectacular environmental damage as done by the Mount Lyell Mining and Railway Company in Tasmania to the King River , or the poisoning from the Panguna mine on Bougainville Island , which led to large-scale civil unrest on the island, and the eventual permanent closing of the mine. This method is used in these cases due to seismic activity and landslide dangers which make other disposal methods impractical and dangerous. Tailings can be conveyed using a pipeline then discharged so as to eventually descend into the depths. Practically, it is not an ideal method, as the close proximity to off-shelf depths is rare. When STD is used, the depth of discharge is often what would be considered[by whom? This method is used by the gold mine on Lihir Island ; its waste disposal has been viewed by environmentalists as highly damaging, while the owners claim that it is not harmful. Pollutants become less bioavailable and livestock, wildlife, and human exposure is reduced. This approach can be especially useful in dry environments, which are subject to wind and water dispersion. Research at the Porgera Gold Mine is focusing on developing a method of combining tailings products with coarse waste rock and waste muds to create a product that can be stored on the surface in generic-looking waste dumps or stockpiles. This would allow the current use of rivering disposal to cease. Considerable work remains to be done. Reprocessing[edit] As mining techniques and the price of minerals improve, it is not unusual for tailings to be reprocessed using new methods, or more thoroughly with old methods, to recover additional minerals. This solid will become mature fine tailings by gravity. Foght et al estimated that there are anaerobic heterotrophs and sulfate-reducing prokaryotes per milliliter in the tailings pond, based on conventional most probable number methods. Foght set up an experiment with two tailings ponds and an analysis of the archaea , bacteria , and the gas released from tailings ponds showed that those were methanogens. As the depth increased, the moles of CH_4 released actually decreased. Those archaea and bacteria can degrade the naphtha, which was considered as waste during the procedure of refining oil. Both of those degraded products are useful. In other words, these methanogens improve the coefficient of utilization. Moreover, these methanogens change the structure of the tailings pond and help the pore water efflux to be reused for processing oil sands. Because the archaea and bacteria metabolize and release bubbles within the tailings, the pore water can go through the soil easily. Since they accelerate the densification of mature fine tailings, the tailings ponds are enabled to settle the solids more quickly so that the tailings can be reclaimed earlier. Moreover, the water released from the tailings can be used in the procedure of refining oil. Reducing the demand of water can also protect the environment from drought.

4: Mine Tailings Disposal Methods

Papers on mine and mill tailings and mine waste, as well as current and future issues facing the mining end environmental communities, are included and discussed in this text. The subjects covered relate to technical capabilities and developments, regulations, and environmental concerns.

The tailings heaps stretch across this image. Tailings, also called mine dumps, culm dumps, slimes, tails, refuse, leach residue or slickens, terra-cone terrikon , are the materials left over after the process of separating the valuable fraction from the uneconomic fraction gangue of an ore. Tailings are distinct from overburden , which is the waste rock or other material that overlies an ore or mineral body and is displaced during mining without being processed. The extraction of minerals from ore can be done two ways: In the latter, the extraction of minerals from ore requires comminution , i. Because of this comminution, tailings consist of a slurry of fine particles, ranging from the size of a grain of sand to a few micrometres. Examples Sulfide minerals The effluent from the tailings from the mining of sulfidic minerals has been described as "the largest environmental liability of the mining industry". Although harmless underground, these minerals are reactive toward air in the presence of microorganisms, leading to acid mine drainage. Yellow boy in a stream receiving acid mine drainage from surface coal mining. Coal and oil sands When applied to coal mining tailings ponds and oil sands tailings ponds , the term "tailings" refers to fine waste suspended in water. Making provision for the approximately 77 million tons that is produced annually is one of the most significant problems for the aluminium mining industry. On average, worldwide, there is one big accident involving a tailings dam each year. See also List of tailings dam failures. Storage methods Historically, tailings were disposed of in the most convenient manner, such as in downstream running water or down drains. Because of concerns about these sediments in the water and other issues, tailings ponds came into use. The sustainability challenge in the management of tailings and waste rock is to dispose of material, such that it is inert or, if not, stable and contained, to minimise water and energy inputs and the surface footprint of wastes and to move toward finding alternate uses. This slurry is a dilute stream of the tailings solids within water that was sent to the tailings storage area. The modern tailings designer has a range of tailings products to choose from depending upon how much water is removed from the slurry prior to discharge. The removal of water not only can create a better storage system in some cases e. In a description of tailings impoundments, however, the U. EPA stated that dewatering methods may be prohibitively expensive except in special circumstances. The ponds were constructed to contain a spill created by EPA workers, while trying to install a cleanup system on the main tailing pond for the long closed mine. Tailing ponds are areas of refused mining tailings where the waterborne refuse material is pumped into a pond to allow the sedimentation meaning separation of solids from the water. The pond is generally impounded with a dam, and known as tailings impoundments or tailings dams. Tailing ponds are often somewhat dangerous because they attract wildlife such as waterfowl or caribou as they appear to be a natural pond, but they can be highly toxic and harmful to the health of these animals. Tailings ponds are used to store the waste made from separating minerals from rocks, or the slurry produced from tar sands mining. Tailings are sometimes mixed with other materials such as bentonite to form a thicker slurry that slows the release of impacted water to the environment. There are many different subsets of this method, including valley impoundments, ring dikes, in-pit impoundments, and specially dug pits. Exhausted open pit mines may be refilled with tailings. In all instances, due consideration must be made to contamination of the underlying water table, amongst other issues. Dewatering is an important part of pond storage, as the tailings are added to the storage facility the water is removed - usually by draining into decant tower structures. The water removed can thus be reused in the processing cycle. Once a storage facility is filled and completed, the surface can be covered with topsoil and revegetation commenced. However, unless a non-permeable capping method is used, water that infiltrates into the storage facility will have to be continually pumped out into the future. Paste tailings Paste tailings is a modification to the conventional methods of disposal of tailings pond storage. 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However although there are potential merits to dry stacked tailings these systems are often cost prohibitive due to increased capital cost to purchase and install the filter systems and the increase in operating costs generally associated electricity consumption and consumables such as filter cloth of such systems. Storage in underground workings While disposal into exhausted open pits is generally a straightforward operation, disposal into underground voids is more complex. A common modern approach is to mix a certain quantity of tailings with waste aggregate and cement, creating a product that can be used to backfill underground voids and stopes. HDPF is a more expensive method of tailings disposal than pond storage, however it has many other benefits â€” not just environmental but it can significantly increase the stability of underground excavations by providing a means for ground stress to be transmitted across voids - rather than having to pass around them â€” which can cause mining induced seismic events like that suffered previously at the Beaconsfield Mine Disaster. In most environments, not a particularly environmentally sound practice, it has seen significant utilisation in the past, leading to such spectacular environmental damage as done by the Mount Lyell Mining and Railway Company in Tasmania to the King River , or the poisoning from the Panguna mine on Bougainville Island , which led to large-scale civil unrest on the island, and the eventual permanent closing of the mine. This method is used in these cases due to seismic activity and landslide dangers which make other disposal methods impractical and dangerous. Tailings can be conveyed using a pipeline then discharged so as to eventually descend into the depths. Practically, it is not an ideal method, as the close proximity to off-shelf depths is rare. When STD is used, the depth of discharge is often what would be considered shallow, and extensive damage to the seafloor can result due to covering by the tailings product. This method is used by the gold mine on Lihir Island ; its waste disposal has been viewed by environmentalists as highly damaging, while the owners claim that it is not harmful. Pollutants become less bioavailable and livestock, wildlife, and human exposure is reduced. This approach can be especially useful in dry environments, which are subject to wind and water dispersion. Research at the Porgera Gold Mine is focusing on developing a method of combining tailings products with coarse waste rock and waste muds to create a product that can be stored on the surface in generic-looking waste dumps or stockpiles. This would allow the current use of rivering disposal to cease. Considerable work remains to be done. Reprocessing As mining techniques and the price of minerals improve, it is not unusual for tailings to be reprocessed using new methods, or more thoroughly with old methods, to recover additional minerals. This solid will become mature fine tailings by gravity. Foght et al estimated that there are anaerobic heterotrophs and sulfate-reducing prokaryotes per milliliter in the tailings pond, based on conventional most probable number methods. Foght set up an experiment with two tailings ponds and an analysis of the archaea , bacteria , and the gas released from tailings ponds showed that those were methanogens. As the depth increased, the moles of CH released actually decreased. Those archaea and bacteria can degrade the naphtha, which was considered as waste during the procedure of refining oil. Both of those degraded products are useful. In other words, these methanogens improve the coefficient of utilization. Moreover, these methanogens change the structure of the tailings pond and help the pore water efflux to be reused for processing oil sands. Because the archaea and bacteria metabolize and release bubbles within the tailings, the pore water can go through the soil easily. Since they accelerate the densification of mature fine tailings, the tailings ponds are enabled to settle the solids more quickly so that the tailings can be reclaimed earlier. Moreover, the water released from the tailings can be used in the procedure of refining oil. Reducing the demand of water can also protect the environment from drought.

5: www.enganchecubano.com â–ª What are tailings? - Their nature and production

Papers on mine and mill tailings and mine waste, as well as current and future issues facing the mining end environmental communities, are included and discussed in this text.

Mill Tailings As discussed previously, the primary types of solid wastes generated by the mining industry are overburden and waste rock from surface mining, waste rock from underground mining, bulk tailings from metal-ore and non-metal mineral beneficiation and milling processes and refuse from coal preparation-plant processes. The methods commonly employed for disposal of these wastes in each of the industry segments that is, coal mining and metal-ore and non-metal mineral mining are described below. Mining Coal Tailings Disposal As has been pointed out earlier in this section, immense quantities of wastes are produced by coal mining activities. Many of the regulations governing these wastes have only recently been enacted, and the Surface Mining Control and Reclamation Act of PL will be a major factor influencing coal mining waste management in the future. The discussion of coal mining waste disposal practices which follows is organized by waste type, since the practices commonly employed are a function of this factor. Overburden Overburden from surface coal mines consist of soils, gravels, shales, coaly shales, and other unconsolidated material and, occasionally, some bedrock which overlies the coal seam. Surface mining is conducted by two basic methods: Contour strip mines are used in hilly or rolling country, such as occurs in the Appalachian coal mining region. Overburden excavations follow the contour of the coal outcrop along the hillside, resulting in long sinuous bands of strip-mined land surrounding the hill. Additional cuts are made into the hillside until the ratio of overburden to coal becomes economically unfavorable. Extraction of the coal may continue by auger mining methods. Generally, the undisturbed overburden then collapses into the empty auger holes, and some surface subsidence may occur. Prior to strict regulations, disposal of overburden during contour mining consisted of leaving the spoil scattered over the natural slope below the cut. The resultant hillside shelf was bordered by a highwall on the uphill side and a steep slope on the downhill side, both of which were subject to erosion and oxidation. The Surface Mining Control and Reclamation Act of now specifically regulates this type of surface mining. As a result, standard contour strip mining methods are increasingly being modified to facilitate contour regrading to minimize overburden handling, and to contain overburden within the mined areas. The modified box-cut or pit-storage mining method is one such technique. Only the overburden removed from the first cut is disposed of downs lope. Overburden from the subsequent cut is deposited into the original cut, and this backfilling process is continued in a stepwise manner. Runoff diversion structures are often constructed ups lope of the mining area to minimize erosion. Box-cut mining employing two cuts is another modified method designed to facilitate backfilling. The terrace created by this technique is frequently sloped toward the highwall; however, this condition is ameliorated by replacing topsoil and by revegetation. The second type of strip mining, area mining, occurs extensively in relatively flat-lying lands of the Midwest and West. This method consists of digging successive parallel trenches, followed by backfilling each trench as the next one is dug. Typically, large areas of land are disturbed, and the distance from the first trench to the last is often a mile or more. After mining, this area is covered with ridges of overburden, which now must be reclaimed and returned to pre-disturbance contours as provided for by the Surface Mining Control and Reclamation Act of It is interesting to note that, with the enactment of the Surface Mining Control and Reclamation Act of , overburden is now regarded by many to be a resource rather than a waste, due to its use in reclamation. The Act also requires the segregation of topsoil from underlying strata during stripping. During subsequent reclamation, the topsoil is spread over the backfilled overburden. It is anticipated that this practice will minimize the effects of surface mining by providing a substrata for revegetation of mined land. Waste Rock Two major methods of underground mining of coal are employed. Room-and-pillar mining is the basic method used in the United States today; however, longwall mining practiced widely in Europe is being practiced with increasing frequency in the United States. Room-and-pillar mining may leave as much as 60 percent of the coal in supporting pillars after initial mining. Later, some of these pillars are removed as equipment retreats from the mined area. Long-wall mining permits increased recovery of coal by extracting coal along a single face which is much longer than used in room-and-pillar mining. Artificial roof support is provided, and advancement through the coal seam proceeds at a faster rate. Much of the waste rock which results from underground mining arises during mine development. Very little waste rock results during actual mining, as nearly all the mined material is sent to either a screening plant that is, tipple or a washing plant, where waste is rejected as refuse. Waste rock which does result is typically disposed of in a surface dump site, located near the mine portal. In some instances, waste rock is disposed of underground in inactive areas of the mine. Surface-disposed waste rock is often used for construction purposes by a mining operation. These uses include construction of impoundment dikes, roads, haulways, and as fill, if required. Often, the surface location used as a waste-rock dump site is subsequently the site used for disposal of coal preparation-plant refuse. Coal Preparation-Plant Refuse Coal preparation occurs in three stages: Flotation is an additional process that is increasingly being used during third-stage cleaning to increase recovery and cleaning of fine coal. Plants which perform first-stage cleaning only that is, screening to size the coal are called tipples. Refuse at tipples results from hand cobbing of impurities from raw coal prior to screening. Water is not used in the cleaning process at tipples. Water is used in second- and third-stage cleaning, and plant-employing these stages of cleaning are, therefore, referred to as washing plants. Second-stage cleaning that is, hydraulic separation is accomplished largely by jigs and tables to achieve gravity separation of coal from impurities. The impurities may or may not be dewatered prior to disposal as refuse. Heavy-medium separation, or third-stage processing, is generally reserved for metallurgical coal. Sized coal is cleaned in the third stage by hydraulic transport of coal through a vessel into which magentite or sand is added to effect the desired fluid density. A fluid density intermediate between the densities of coal and non-coal material effects a stratification of material according to specific gravity. Non-coal material, or reject, separated in this manner is generally dewatered and disposed of as refuse. A third-stage process which is gaining increasing use is flotation. This process allows increased recovery and cleaning of fine coal which previously has generally been discarded with refuse. The reject from flotation is typically thickened and hydraulically transported to an impoundment area. Refuse from coal cleaning can generally be classified as either coarse or fine. Separation between the two is usually accepted as the number 4 sieve. At washing plants using second- or third-stage cleaning, coarse refuse typically constitutes 70 to 80 percent by weight of the total refuse produced. The disposal methods for coarse and fine refuse generally differ, since fine refuse is most often disposed of in slurry form, while coarse refuse is not. Washing-plant refuse fines typically are hydraulically transported to ponds for sedimentation of solids and clarification of the water for reuse or discharge. Pond seepage-prevention measures are not extensively employed, and pond lining practices are not known in this industry. At operations where slurry ponds have large drainage areas above pond elevation, surface runoff diversion is often practiced to reduce the influx of water from this source. A major advantage of fine-refuse disposal by submersion in a settling pond is that oxidation of pyritic material, with the resultant production of acid, is effectively reduced due to the much lower diffusion of oxygen in water than in air. Past practice for coal washing-plant slurries generated at some strip-mining operations in the Midwest was disposal in successive rows of old spoil banks or, more commonly, in the last furrow of such mines. The principal environmental concern at such operations was seepage through the semipermeable spoil banks and subsequent contamination of ground water. For this reason, the placing of slurry ponds or other type of water impoundment on mine spoil is considered to be a poor practice and is now generally discouraged. An alternative to pond disposal of washing-plant slurries is dewatering of the slurry at the preparation plant and subsequent disposal of the fine refuse with coarse refuse. This practice is gaining increasing use, as a greater number of washing plants now incorporate closed process-water loops. Slurry dewatering generally involves mechanical thickening and filtering. A disposal alternative at underground mining operations is hydraulic backfilling of washing-plant refuse. This practice was reportedly first employed in at an anthracite mine in Pennsylvania. This practice has not gained widespread usage, however, due to unfavorable economics at currently operating mines. However, it has been concluded that the economics of underground disposal could improve in future mines specifically designed for this purpose. The primary method of disposal of coarse preparation-plant refuse is land disposal in piles. In the past, environmental concerns were given little consideration, and the waste disposal site may have been adjacent to the preparation plant, over the nearest hillside, or in a stream bed. However, present-day state and federal laws governing refuse disposal generally prescribe more rigorous methods for disposal-site selection and waste-pile construction. Several types of piles, such as valley-fill, side-hill, and waste-heap, are now commonly employed. Valley-fill piles are frequently located above a slurry pond or sedimentation-pond system. For pollution control, the valley is filled starting at the head and proceeding downslope. Refuse is disposed of in benches. Each bench is sloped to drain away from the next working bench, and finished benches are covered with soil as required for reclamation procedures. Ideally, the pile is constructed to a height such that drainage from the finished surface can be readily directed into the ponds, thereby eliminating the need to construct and maintain ditches along the side of the valley. Side-hill refuse disposal is similar to the valley-fill method, except that a permanent ditch is constructed immediately above the upper limit of the pile. Both uphill natural drainage and surface drainage from the finished portion of the pile are routed to the ditch and drained away from the pile. The waste-heap disposal configuration is largely dependent upon the acid-producing status of the waste; however, design of all waste heaps is cellular in nature. The object is to build and reclaim individual cells to minimize exposed surfaces and to reduce the water-pollution potential. Acid-producing waste heaps are generally more cellular, with much greater usage of poorly permeable material, such as clay, to isolate cells from water. Refuse placement techniques are practiced to prevent particle size and material segregation during disposal. Coupled with prompt compaction of waste by effective compaction techniques, proper material placement minimizes exposure of waste to oxidizing forces and ensures that waste piles are resistant to ground-water infiltration long after active dumping is ceased. Waste blending is sometimes practiced to increase the impermeability of disposed waste. Subdrains are commonly required in the rolling countryside of the Appalachian region but are seldom needed in the less rugged topography of the Midwest. Proper construction of the subdrain system is critical. Where overlying refuse is acid-producing, the permeable portion of the system requires isolation from the refuse-pile leachate to prevent contamination of the ground water. Diversion of runoff away from refuse piles is a commonly practiced method of reducing the overall pollutant loading to ground and surface water. Siltation basins are often located downslope from refuse piles to minimize discharge of silt-laden runoff. The basins frequently serve other purposes, make-up water ponds , recirulating ponds, receiving basins for slurry-pond waste, or emergency slurry ponds.

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6: Tailings & Mine Waste

The proper management of waste such as tailings and wastewater is one of the most essential processes of any mining or quarrying operation. A scalable waste management solution is paramount to the efficient functioning of your mine site and it's essential every site adhere to relevant guidelines in handling waste products.

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7: Mine Waste Tailings Beaching

proceedings of the fifth international conference on tailings and mine waste '98/fort collins/colorado/usa/ january tailings and mine waste '

The tailings heaps stretch across this image. Tailings, also called mine dumps, culm dumps, slimes, tails, refuse, leach residue or slickens, are the materials left over after the process of separating the valuable fraction from the uneconomic fraction gangue of an ore. Tailings are distinct from overburden , which is the waste rock or other material that overlies an ore or mineral body and is displaced during mining without being processed. In the latter, the extraction of minerals from ore requires comminution , i. Because of this comminution, tailings consist of a slurry of fine particles, ranging from the size of a grain of sand to a few micrometres. Examples Sulfide minerals The effluent from the tailings from the mining of sulfidic minerals has been described as "the largest environmental liability of the mining industry". Although harmless underground, these minerals are reactive toward air in the presence of microorganisms, leading to acid mine drainage. Yellow boy in a stream receiving acid mine drainage from surface coal mining. Coal and oil shale When applied to coal mining tailings ponds and oil sands tailings ponds , the term "tailings" refers to fine waste suspended in water. Making provision for the approximately 77 million tons that is produced annually is one of the most significant problems for the aluminium mining industry. They have the potential to damage the environment by releasing toxic metals arsenic and mercury being two major culprits , by acid drainage usually by microbial action on sulfide ores , or by damaging aquatic wildlife that rely on clear water vs suspensions. On average, worldwide, there is one big accident involving a tailings dam each year. Storage methods Historically, tailings were disposed of in the most convenient manner, such as in downstream running water or down drains. Because of concerns about these sediments in the water and other issues, tailings ponds came into use. The sustainability challenge in the management of tailings and waste rock is to dispose of material, such that it is inert or, if not, stable and contained, to minimise water and energy inputs and the surface footprint of wastes and to move toward finding alternate uses. Tailings dam Bounded by impoundments an impoundment is a dam , these dams typically use "local materials" including the tailings themselves, and may be considered embankment dams. This slurry is a dilute stream of the tailings solids within water that was sent to the tailings storage area. The modern tailings designer has a range of tailings products to choose from depending upon how much water is removed from the slurry prior to discharge. The removal of water not only can create a better storage system in some cases e. In a description of tailings impoundments, however, the U. EPA stated that dewatering methods may be prohibitively expensive except in special circumstances. The ponds were constructed to contain a spill created by EPA workers, while trying to install a cleanup system on the main tailing pond for the long closed mine. Tailing ponds are areas of refused mining tailings where the waterborne refuse material is pumped into a pond to allow the sedimentation meaning separation of solids from the water. The pond is generally impounded with a dam, and known as tailings impoundments or tailings dams. Tailing ponds are often somewhat dangerous because they attract wildlife such as waterfowl or caribou as they appear to be a natural pond, but they can be highly toxic and harmful to the health of these animals. Tailings ponds are used to store the waste made from separating minerals from rocks, or the slurry produced from tar sands mining. Tailings are sometimes mixed with other materials such as bentonite to form a thicker slurry that slows the release of impacted water to the environment. There are many different subsets of this method, including valley impoundments, ring dikes, in-pit impoundments, and specially dug pits. Exhausted open pit mines may be refilled with tailings. In all instances, due consideration must be made to contamination of the underlying water table, amongst other issues. Dewatering is an important part of pond storage, as the tailings are added to the storage facility the water is removed - usually by draining into decant tower structures. The water removed can thus be reused in the processing cycle. Once a storage facility is filled and completed, the surface can be covered with topsoil and revegetation commenced. However, unless a non-permeable capping method is used, water that infiltrates into the storage facility will have to be continually pumped out into the future. Paste tailings Paste tailings is a modification to the conventional methods of disposal of tailings pond storage. Paste tailings has the advantage that more water is recycled in the processing plant and therefore the process is more water efficient than conventional tailings and there is a lower potential for seepage. However the cost of the thickening is generally higher than for conventional tailings and the pumping costs for the paste are also normally higher than for conventional tailings as positive displacement pumps are normally required to transport the tailings from the processing plant to the storage area. There is a growing use of the practice of dewatering tailings using vacuum or pressure filters so the tailings can then be stacked. However although there are potential merits to dry stacked tailings these systems are often cost prohibitive due to increased capital cost to purchase and install the filter systems and the increase in operating costs generally associated electricity consumption and consumables such as filter cloth of such systems. Storage in underground workings While disposal into exhausted open pits is generally a straightforward operation, disposal into underground voids is more complex. A common modern approach is to mix a certain quantity of tailings with waste aggregate and cement, creating a product that can be used to backfill underground voids and stopes. HDPF is a more expensive method of tailings disposal than pond storage, however it has many other benefits â€" not just environmental but it can significantly increase the stability of underground excavations by providing a means for ground stress to be transmitted across voids - rather than having to pass around them â€" which can cause mining induced seismic events like that suffered previously at the Beaconsfield Mine Disaster. In most environments, not a particularly environmentally sound practice, it has seen significant utilisation in the past, leading to such spectacular environmental damage as done by the Mount Lyell Mining and Railway Company in Tasmania to the King River , or the poisoning from the Panguna mine on Bougainville Island , which led to large-scale civil unrest on the island, and the eventual permanent closing of the mine. This method is used in these cases due to seismic activity and landslide dangers which make other disposal methods impractical and dangerous. Tailings can be conveyed using a pipeline then discharged so as to eventually descend into the depths. Practically, it is not an ideal method, as the close proximity to off-shelf depths is rare. When STD is used, the depth of discharge is often what would be considered shallow, and extensive damage to the seafloor can result due to covering by the tailings product. It is also critical to control the density and temperature of the tailings product, to prevent it from travelling long distances, or even floating to the surface. This method is used by the gold mine on Lihir Island ; its waste disposal has been viewed by environmentalists as highly damaging, while the owners claim that it is not harmful. Pollutants become less bioavailable and livestock, wildlife, and human exposure is reduced. This approach can be especially useful in dry environments, which are subject to wind and water dispersion. Research at the Porgera Gold Mine is focusing on developing a method of combining tailings products with coarse waste rock and waste muds to create a product that can be stored on the surface in generic-looking waste dumps or stockpiles. This would allow the current use of rivering disposal to cease. Considerable work remains to be done. Reprocessing As mining techniques and the price of minerals improve, it is not unusual for tailings to be reprocessed using new methods, or more thoroughly with old methods, to recover additional minerals. This solid will become mature fine tailings by gravity. Foght et al estimated that there are anaerobic heterotrophs and sulfate-reducing prokaryotes per milliliter in the tailings pond, based on conventional most probable number methods. Foght set up an experiment with two tailings ponds and an analysis of the archaea , bacteria , and the gas released from tailings ponds showed that those were methanogens. As the depth increased, the moles of CH_4 released actually decreased. Those archaea and bacteria can degrade the naphtha which was considered as waste during the procedure of refining oil. Both of those degraded products are useful. In other words, these methanogens improve the coefficient of utilization. Moreover, these methanogens change the structure of the tailings pond and help the pore water efflux to reuse for processing oil sands. Because the archaea and bacteria metabolize and release bubbles within the tailings, the pore water can go through the soil easily. Since they accelerate the densification of mature fine tailings, the tailings pond are enable to settle the solids more quickly so that the tailings can be reclaimed earlier. Moreover, the water released from the tailings can use it in the procedure of refining oil. Reducing the demand of water can also protect the environment from drought.

8: Tailings and mine waste '98 (edition) | Open Library

PanAust Limited's approach to mine waste and tailings stewardship Peter Trout PanAust Limited (PanAust) has constructed and commissioned two mining operations in Laos over the past decade and undertaken major studies for three new mine developments.

Select Page Types of Mine Waste and Disposal Methods Learn about different types of mine waste and how it is stored and handled after the mining operation has completed. This is evident by catching a glimpse of any mining operation and the scale at which they operate. Mine wastes can be problematic due to the fact they contain hazardous material that can be released into the environment if not properly handled. Some of these hazardous materials include heavy metals, metalloids, radioactive waste, acidic water, and process chemicals. First, to access the actual seams or veins of ore, the top layers of rock, or overburden, must be removed. Once the overburden has been removed, the seams can be extracted. When extracting the seams, the additional waste rock will be removed to get to the actual ore, called gangue. Then, as the material is processed and finely ground, even more, waste, called mine tailings, will need to be removed from the site. Typically, for every ton of ore that is mined, 5 tons of overburden must be displaced. Overburden is not subjected to any chemical processes, but must still be removed in order to access ores. Overburden is usually managed by piling it on the nearby surface of mining sites in an area that will not interfere with ongoing operations. Transporting such large volumes of material is costly, so overburden is stored nearby and often used for revegetating the land upon closure of the mine. Gangue Gangue is the worthless rock or material that is closely mixed with the valuable material to be processed. The separation of mineral from gangue is called mineral processing. Often times, inefficient processing methods can produce gangue that still holds an ample amount of valuable minerals. As values of minerals increase, it can even be profitable to reprocess gangue to extract additional minerals that may have been missed during the first processing. Mine Tailings Tailings are finely ground rocks and other mineral waste as a result of mineral processing. Due to the way minerals are processed, tailings can contain concentrations of processing chemicals. This can make mine tailings an environmental concern, so proper transportation and disposal are crucial. Consequently, the next step is to pump mine tailings away with slurry pumps into tailings ponds. Tailings ponds are sedimentation holding ponds enclosed by dams and liners to capture and store the waste. Liquid Mine Waste Mine Water Mine water is produced in a few different ways at mine sites and can vary in levels of contamination. Water exposed to mining processes is also often acidic and can contaminate local water sources in a process called acid mine drainage AMD or acid rock drainage ARD. Acid mine drainage is a heavy contributor to pollution of surface water across the globe. AMD is primarily caused when water flows over the sulfide-heavy material, forming an acidic solution. Water at mine sites is usually heavily monitored and management strategies are used to not only reduce the amount of mine water produced but also to treat the water before it is released back into the environment. Water Treatment Sludge Sludge is produced at some mine sites and is similar to mine wastewater, but has the additions of solids and processing chemicals. These additions turn the water into a more viscous sludge which can then be pumped away from the site. In extreme cases where the sludge is rich in harmful or radioactive material, it may be classified as hazardous waste and require special handling and disposal methods. Mine Waste Management Waste management techniques employed by mining companies are routinely under intense scrutiny from local governments and the general public. Improper disposal methods and the resulting environmental damages have plagued the history of the mining industry. These actions have left a negative stigma associated with mining and associated waste materials. For this reason, many countries now require miners to prepare a complete mine waste storage proposal before a mining permit will even be granted. To ensure long-term storage stability and prevent breaking any regulations, mine waste is carefully managed at every step of the process. The volume of waste from mining operations is high, and due to the large volumes of waste, environmental concerns will inevitably arise. In response, mining engineers have developed clever ways of waste management, making the mining industry one of the few that actively recycle their own waste. Overburden is used for reprocessing, contouring land, and as a construction aggregate for buildings and roads. Mine tailings are reused for producing clay, tiles, glass, and concrete. Despite numerous recycling methods, the majority of mine waste is still stored in facilities or waste sites. The long-term storage of these facilities has become an important topic in modern mine closures. Various regulations have come to pass that require the waste to be stable for years, sometimes centuries. This requires engineers to develop storage methods to withstand catastrophic events like floods, heavy storms, and earthquakes. Lasting Environmental Impact The main environmental impacts of mining waste include the loss of land following its conversion to a tailings pond or waste storage area and the introduction of acidic runoff or other contaminated sediments into the local environment. The specific environmental impact of waste depends heavily on the materials composition, type of ore mined, and the way the ore is processed. For example, gangue and tailings from mining heavy metals could have a high concentration of sulfides which could cause acid rock drainage to occur. Due to the many variables, mining operations will need to develop their own methods of waste disposal in accordance with regulations pertaining to different types of waste they produce. However, it is worth noting that a large portion of mining waste is benign to the environment and is routinely used to revegetate or contour the land when the mining operation has been completed.

9: Abstracts â€“ Tailings & Mine Waste

Learn about different types of mine waste including overburden, gangue, waste rock and mine tailings, and how they are stored and handled after the mining operation has completed.

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