



ENGINEERING AND CONSULTING DIVISION
MINING ENGINEERING, SURVEYING AND PERMITTING SERVICES
MINING ENGINEERING

- MINE DE-WATERING SYSTEM DESIGNS
- IN-GROUND RESERVE ASSESSMENTS
- OPERATIONS SYSTEM ASSESSMENT
- AMD TREATMENT SYSTEM DESIGN
- COAL PREPARATION PLANT ASSESSMENT AND DESIGN
- VENTILATION SYSTEM DESIGN
- HAULAGE SYSTEM DESIGN
- MINE CLOSURES INCLUDING DEMOLITION, SHAFT FILLING, ETC.
- UNDERGROUND MINE INJECTION SYSTEM DESIGN



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MINE DE-WATERING SYSTEM DESIGNS

Miltech engineers have many years of experience analyzing mine de-watering systems and requirements, and designing pumping systems to meet those requirements. Underground mine de-watering systems include the use of gathering pumps, local sumps, and pipelines needed to keep working face areas and other areas de-watered. Oftentimes, underground pipelines tee into other pipelines, requiring careful pumping and piping calculations to insure that specified pump and pipe characteristics meet pressure and quantity requirements throughout the pumping/piping network. Similar calculations are used for surface mine pumping applications, and for other industrial applications.

Underground mine water is normally pumped from local sumps to a main underground sump, from which water is pumped to the surface. Water pumped to the surface may be pumped from an underground pump station, or from a vertical turbine or deep well pump located on the surface. Vertical turbine and deep well pumps are also used to de-water abandoned underground mines.

Miltech's mine de-watering services include:

- Analyzing mine de-watering and pumping requirements
- Designing an efficient system to meet the de-watering requirements, while making provisions for possible future needs
- Specifying pumps and piping systems that satisfy the design requirements
- Designing pump stations and piping layouts
- Assisting with installations and startup as required by the client.

For additional related information see:

- Slurry Transport System Design
- SNCR System Design



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IN-GROUND RESERVE ASSESSMENTS

To determine the quantity and quality of the reserves within geologic and/or property limits, in-ground reserve assessments are performed. Geologic information, information from nearby mining operations, and drill hole information are used in making the assessment. If the information available is insufficient for the degree of accuracy desired for the reserve assessment, additional exploration, such as core drilling and channel sampling, may be required.

Once all of the reserve information is assembled, it is analyzed to determine the quantity and quality of the in-ground reserves. The analysis can be relatively straightforward for virgin reserves within relatively uniform boundaries. The assessment can become much more complicated when numerous leaseholds of irregular shapes, and/or reserves that are partially mined, are involved. The assessment takes all factors into account, and provides standard geologic and statistical confidence limits to describe the accuracy of the reserve assessment.

Miltech Energy Services, Inc. performs assessments for both in-ground bituminous coal reserves, and in-ground limestone reserves. These assessments have been used by clients to evaluate whether or not the quantity and quality of the reserve assessed is adequate to fulfill the requirements of specific projects being considered. Assessments are also used for valuation purposes when purchases, sales, or leases are under consideration.

Miltech provides the following reserve assessment services:

- Evaluate available information.
- Perform additional drilling, channeling sampling etc., as needed.
- Provide sample analyses services through Miltech's Analytical Division.
- Determine the quantity and quality of the in-ground reserve within the confidence limits desired.



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OPERATIONS SYSTEM ASSESSMENT

Miltech Energy Services, Inc. can review and assess underground and surface mining systems for the purposes of:

- Determining current and potential capabilities.
- Defining and quantifying bottlenecks and problem areas.
- Offering recommendations for improvement.

Sometimes only one or two of the above assessments is desired. Sometimes all three may be desired.

For clients with little experience and knowledge related to mining systems, Miltech can provide comprehensive explanations and report finding and recommendations in terms that can be used as a basis for decision making. For knowledgeable and experienced clients such as mine operators, Miltech can provide assistance in locating areas for potential improvement, preparing long term mining plans and budgets, developing alternatives for consideration, etc.

Feasibility studies for potential new mining projects may be desired. As a part of those studies Miltech can prepare conceptual mining plans, equipment requirements and recommendations as well as projected costs. Miltech can also review and comment on plans that have been prepared by others.



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ACID MINE DRAINAGE TREATMENT SYSTEM DESIGN

Miltech engineers and consultants have participated in the design, maintenance and operation of simple to complex Acid Mine Drainage (AMD) Treatment Systems.

At one company, Miltech has, over the past seven years been providing operations, control, sampling, compliance and engineering services related to day-to-day operation of five AMD plants that together treat about 15 million gallons per day of acid mine water from deep mines.

These AMD Systems include the following unit operations:

- Vertical turbine pumping from mine depths up to 750 feet
- Lime Slaker systems to produce lime slurries for treating the acid water
- Mixing systems
- Static Thickeners
- Thickener sludge removal and discharge into abandoned mines
- Quality control of thickener overflow water to local streams

Miltech engineers and technicians are capable of designing all or any portion of AMD systems regardless of system complexity. Moreover, Miltech offers 24 hour per day operating and engineering services for operating AMD Systems.

For more information see:

- Lime Slaking System design
- Mine De-Watering Systems Design
- Underground Mine Injection System Design



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COAL PREPARATION PLANT SYSTEM ASSESSMENT AND DESIGN

Miltech's expertise and experience in the area of coal preparation includes all of the key unit operations needed to transform a raw coal (reserve) into a marketable product.

Examples of the operations included in these coal preparation systems are:

- Raw coal analyses such as coal washability with coal quality on coal sizes and specific gravity fractions to be used as a basis for coal preparation system design
- Material handling and blending of raw and clean coal
- Preparation plant circuit design including sizing of all plant unit operations, electrical, structural and water systems
- Refuse handling and disposal

Miltech has successfully evaluated and designed these coal preparation systems for our clients by providing the following services:

- Analytical services such as coal sampling and analyses, coal size and washability studies and bias testing of sampling systems
- Coal preparation plant efficiency
- Preparation plant systems design and assessment of existing systems
- Materials handling systems assessment and design
- Coal preparation plant system trouble shooting
- Design and permitting of refuse handling and disposal systems

Miltech's coal preparation system expertise combined with our expertise in coal reserve assessments and mining systems design and assessments provides our clients with a complete line of services needed to assess or design all of the systems involved in transforming a coal reserve into a saleable product.

Also see:

- Analytical Division Services
- AMD Treatment System design
- Surveying and Mapping
- Haulage system design
- Permitting



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VENTILATION SYSTEM DESIGN

Miltech Energy Services engineers have experience with ventilation systems pertaining to underground mines including:

- Mine wide ventilating system layouts, networks, fan characteristics and selections, and shaft requirements
- Auxiliary ventilation systems utilizing section fans and ventilation tubing
- Ventilation bore holes, methane bore holes, and bleeder shafts
- Ventilating dead ended shafts and openings prior to filling and sealing

An underground limestone mine client of Miltech's had been operating utilizing only natural ventilation throughout the mine. As the mine advanced farther from the drift openings, maintaining adequate ventilation at the working faces became increasingly difficult. Miltech was asked to evaluate the benefits of sinking a shaft to the mine near the working faces, and to propose ventilation options. Mining height was a minimum of 30', and entry widths were 50', making stoppings for ventilation control costly and difficult to construct and maintain. A mining plan and a ventilation concept were developed utilizing a shaft near the working faces with a fan on the surface, and with ventilation tubing connected to the bottom of the shaft that would be advanced with mining. The concept was workable, but the mine closed before it was implemented.

A central Pennsylvania underground coal mine was having difficulty maintaining ventilation near the back end of a bleeder entry. Miltech was aware of the availability of surplus blowers at a closed coal mine that had been operated by another company. Miltech engineers designed a bleeder entry ventilation facility utilizing one bore hole with two of the surplus blowers in parallel, to achieve the desired ventilation. The bore hole was drilled, the blowers were installed, and the ventilation problem in the bleeder entries was resolved.

Miltech supervised the filling of nine shafts at a closed mine in southwestern Pennsylvania. Some of the shafts contained explosive concentrations of methane. A special methane probe was purchased to remotely determine the presence or absence of methane in a shaft. If methane existed, tubing was extended to the bottom of the shaft and connected to a compressor on the surface. The compressor was turned on and the shaft was ventilated until it was cleared of methane. The tubing was then removed from the shaft and shaft filling began. Periodic methane checks were made to verify that methane had not accumulated once again, before shaft filling resumed.

For additional related information see:

- Mine Closures Including Demolition, Shaft Filling, Etc.



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HAULAGE SYSTEM DESIGN

Miltech Energy Services, Inc. has experience designing haulage systems and selecting appropriate haulage system components. Designing an underground or surface conveyor belt installation requires knowledge of the material to be conveyed, tonnage requirements, the planned length and grade of the conveyor system, required transfer points, etc. With this information, the belt width, belt strength, belt composition, belt speed, idler size and spacing, troughing angle, horsepower requirements, etc. can be calculated and specified.

Surface mine truck haulage systems require similar input information for specifying the capacity, type, and number of trucks required for a particular application. Miltech also specifies the excavation, loading and transferring equipment required for optimizing the total system.

Previous Miltech work in this area has involved selecting mining and haulage equipment used for re-mining coal refuse piles and culm banks. The mined material is often used to fuel fluid bed boiler power plants. The mine site load out facility transfers mined material to highway trucks, railroad cars, or barges for transportation to the power plant. The optimum means of transporting mined fuel from the mine site to the power plant depends on the transportation distance, the facilities and infrastructure that exist, fuel scheduling, etc. Oftentimes, the return of boiler ash to the mine site, which has both environmental and cost benefits, becomes part of the overall haulage system design.

For additional information see:

- Mine Plans (blending, stockpiling, equipment, transport, costs, reclamation, etc.)
- Operations Management of In-House Excavation and Transportation Service
- Operations Assessment of In-House and Contracted Excavation and Transportation
- Fuel Handling System Design



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MINE CLOSURES INCLUDING DEMOLITION, SHAFT FILLING, ETC.

Miltech Energy Services, Inc. is experienced in all aspects of mine closures including:

- Complying with approved mine permits
- Submissions to agencies and follow-up to approval as needed
- Working with federal, state and county agencies and inspectors to assure compliance with permits, applicable laws and regulations
- Preparing specifications and bid documents for the demolition of mine buildings and structures, sealing mine bore holes, sealing drift entries, filling mine shafts, etc.
- Locating suitable material for shaft filling
- Site surveying, grading plans, and mapping, including cut/fill balances
- Performing all closure work, or supervising the client's contractor

For one client closing an underground coal mine in southwestern Pennsylvania, Miltech coordinated and supervised:

- The sealing of over 50 mine holes, and the safe filling of nine mine shafts
- The dismantling of several mine ventilating fan installations over open mine shafts
- The demolition of a portal building and other mine buildings
- The demolition of hoisting facilities
- The reclamation of sludge ponds and surface facilities

Several of the mine shafts that were filled contained explosive concentrations of methane gas, requiring frequent examinations and ventilation during the filling process. Miltech has qualified personnel on staff for making the proper examinations, insuring proper ventilation, and maintaining safe working conditions.

Fill material for three large shafts was not available on site. To fill these shafts Miltech worked with the client to locate and secure a source of treated fly ash/scrubber sludge from a nearby power plant. This fly ash product was approved for beneficial uses, including filling mine shafts. Approximately 15,000 tons of this approved material were trucked to the site (approximately 700 triaxial truckloads) and used to fill the shafts.

Other shafts and facilities required that final cover material in sufficient quantities be located for final reclamation and vegetation. Miltech used a backhoe to dig pits in the vicinity of the areas needing cover material for the purpose of identifying the quality and quantity of the cover material available. Excavation and grading plans were prepared, and followed as reclamation proceeded. All of the work performed on the entire project was completed safely without a single injury to any of the workmen involved.



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MINE CLOSURES INCLUDING DEMOLITION, SHAFT FILLING, ETC. (Continued)

For additional related information see:

- Topographic Surveying and Mapping
- Scrubber Sludge De-Watering and System Designs
- Permit Compliance
- Coal Ash Beneficial Use Permitting
- Ventilation System Design



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UNDERGROUND MINE INJECTION SYSTEM DESIGN

Underground injection systems usually pertain to the injection of waste slurries, such as water treatment sludge or power plant fly ash, to abandoned underground mines, or to abandoned areas of active underground mines. It is possible to inject other waste slurries to underground mines as well. Miltech Energy Services, Inc. has experience and expertise in the design and the operation of mine injection systems.

Slurry is normally injected from the surface to underground mines via bore holes. Knowledge of underground mining and the ability to read mine maps are prerequisite to selecting the injection location. For old abandoned mines, relating underground locations to points on the surface can be tricky, if surface control points related to the underground mine coordinate system no longer exist. For such situations GPS technology sometimes proves to be useful. Surface ownership, environmental considerations, water supplies, and compliance with regulations all play roles in selecting a bore hole location, and in routing the pipeline to it.

Miltech selected injection bore hole locations to an abandoned underground for a coal burning power plant desiring to inject fly ash into the mine. Miltech also designed the pumping and piping system from the power plant to the bore hole. For another client Miltech operates mine water treatment plants, and injects the sludge from those treatment plants back to the same mines.

Miltech provides underground mine injection system design services including:

- Researching mine maps for selecting potential injection locations
- Relating the underground mine coordinate system to the surface system so that bore holes can be drilled in their proper locations
- Designing bore hole installations and preparing drilling specifications
- Design pumping and piping systems
- Preparing operation and control plans
- Researching surface ownership, and preparing legal descriptions
- Preparing specifications and bid documents
- Permitting
- Installation and startup assistance.

For additional related information see:

- Slurry Transport System Design
- Underground Mine Surveying
- Property Surveying
- Underground Mine Injection Permitting