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Mine Dewatering—A Package Approach

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This discussion will attempt to cover the general areas and problems encountered in the design and installation of an underground dewatering system. Prior to designing any system, the areas of geology, hydrology, and ecology should be thoroughly investigated.

The geological considerations will dictate the ultimate design of the mine. It will be the controlling factor in the operation of the mine. It will also dictate the basic head conditions, type of discharge piping, flow control system, power requirements, gathering equipment, and the location of the necessary treatment equipment and mine openings.

The hydrological considerations will dictate the capacity of the dewatering system. The capacity of the system should be carefully considered. This information will size all the equipment to be used such as pumps, pipes, fittings and the power supply. This study should include the quality of the water. This will give the parameters for the material selection. Also included should be any seasonal flow patterns if they can be determined.

The ecological considerations must include the quality of the water that will be delivered to the receiving stream. The quantity of water should also be a major consideration. Is the discharge water going into an existing stream or will the discharge create its own stream? If the water has to be treated, can the treatment equipment be feed in surges or must it receive the water in a continuous flow? Once these areas have been covered, the overall design can be completed.

Given this data and knowing that it is accurate, the system can be designed. With the vertical head and flow being known, the discharge system can be selected. This may appear to be starting in the middle of the system and it is. I have started at the bottom and worked my way to the surface many times only to discover that there was not room for the 12 inch or 14 inch discharge pipe. I have been asked if I could get by with two 6 inch lines. Six and six does make twelve. The 1,000 feet of head turned into 1,300 feet and the horsepower requirements went up by 30 percent.

This also increased the size of all electrical equipment. This is why a system design should start with the discharge piping. This item is so critical that we have a routine programmed into our computer to calculate pipe size, friction loss and horsepower just for this reason.

Now we have our two basic numbers: total flow and total dynamic head. This will allow us to select the proper pumping equipment and will give us the horsepower necessary to drive the system. In turn this will allow us to select the proper switch gear, power conductors and standby generators if these are necessary.

The next step in this process is to select the proper pump materials (i.e. cast iron, bronze, stainless steel etc.). This should be done only after evaluating the quality of the water. Is it an aggressive water? Will it carry a high concentration of abrasives? Will dissolved gas be a problem? Hydrogen sulfide for example is very corrosive and is easily removed from the water by slight aeration. It is apparent that the sump design is very important.

The sump should be designed for easy access for cleaning and pump repair. If gas is a problem, a tight fitting top should be a part of the sump design. If sand or other abrasives are carried in the water, the sump should allow for adequate detention time to allow settling or treatment.

To preclude cycling, the sump design should include all necessary gathering equipment and drains. A common power supply should be used as much as possible to preclude power interruptions and line relocations. This also will give a central location to check power consumption and pump performance. If the power consumption is up and the flow down, it is time for maintenance or at least a check. The design should include necessary level controls, alarms and backup control systems.

We now have selected all the equipment and designed the sump. The only consideration left is the redundancy of the system. The average system should have a minimum of 50 percent in spare parts. The spare parts may have to be increased if the wear is above normal or are difficult to obtain.

The system is now designed and ready for installation and startup. What problem areas need to be considered? If all areas were evaluated properly, there should be only a few problems. The problem now becomes one of operator training and maintenance. There is no substitute for good personnel and adequate maintenance. Records should be maintained on all repair work and duration of operation. Repair frequency should be carefully noted. These will help make any modification to the equipment that may be necessary.

In closing, I would like to make one comment. Of all the areas that a package dewatering system covers, the most important is the initial design information. If this information is not accurate, then the design will not be adequate. If the information is accurate, then by all means use it. Many times thousands of dollars in field studies were left in the filing cabinet and the old rule of thumb was used to design a system. Then the system became a bottleneck to the entire mine operation. If you have good information, use it. If not, get it.