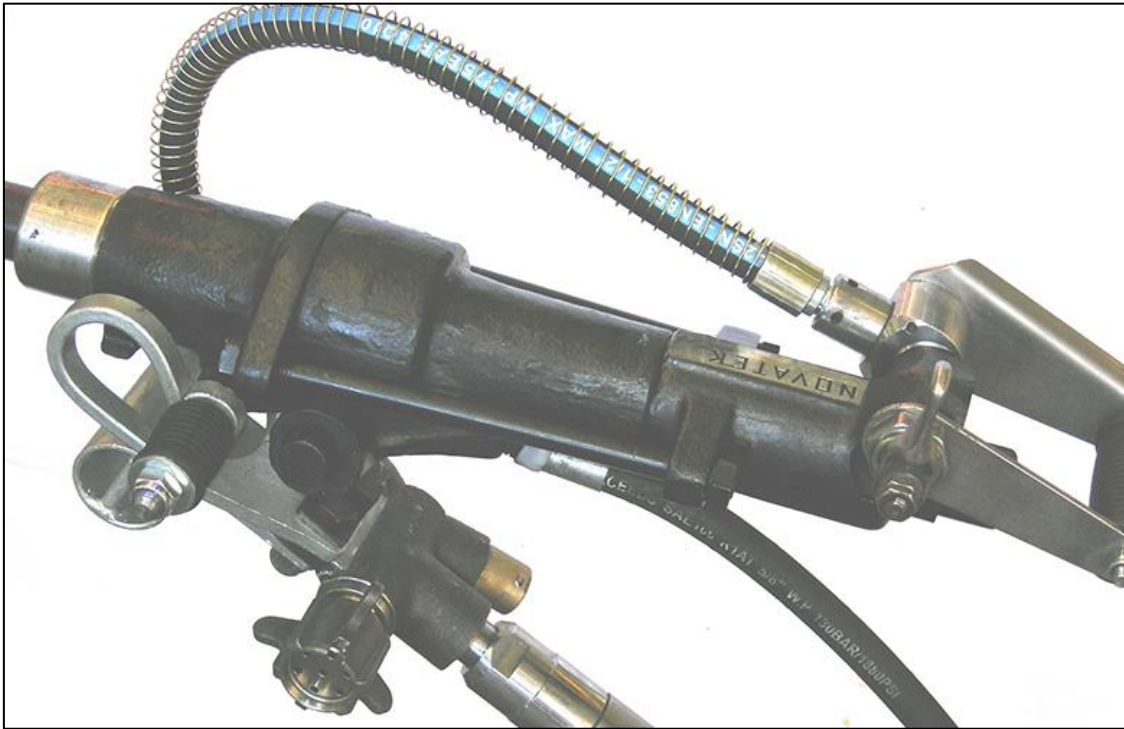


## Hydropower Overview – What, Why, How?



Hydropower for mining was developed for SA mines from the 1980s under the Chamber of Mines, Novatek's predecessor being a key collaborator. It was developed for deep gold mines to use the mine cooling water to also power machinery, thus saving energy.

It has since expanded to shallower mines and applications using localised pumps to provide the necessary pressure.

Hydropower holds many benefits; energy savings can be 90% compared to compressed air systems; labour productivity can be doubled and safety improved. The working environment is also improved by eliminating oil lubricators, exhaust misting and reducing noise.

The economics also make sense; capital costs are lower than compressed air systems and much lower than highly mechanised systems.

Electrical power costs have increased 300 % in the last few years and labour costs have increased but productivity has stagnated. Hydropower can double drilling labour productivity and saves energy (up to 90%).

The technologies can be adapted to suit a range of mining operations, from hand-held drilling to 'appropriate technology' drill rigs to more mechanised mining systems. By 'appropriate technology' we mean systems and equipment that suit the orebody and mining layout, available skills, the mine infrastructure, capital and operating cost profile of the mine.

# Turnkey Projects & Micro Hydropower Systems

Not all customers have the experience to specify and install a hydropower system. Novatek provide a full service to design a suitable system to meet customer requirements and install and commission the system on a turnkey basis.

We also provide training and on-site maintenance to make the process simple – so that our customers can concentrate on their business of mining!

Micro hydropower systems are a great way to see the technology first-hand in your own mine. It allows each mine to review their objectives, performance, changes required, problems and their solutions. Most importantly, it allows an assessment of the production and financial impact. Thereafter, the decision to expand the technology can be made with full confidence.

Novatek are able to setup these turnkey projects and work with the mine to develop the mine's expertise progressively, allowing a small project to expand to a full-scale implementation.

Please remember; the technology may be new to you... it is not new to us!

## Powering Systems

High pressure water is either produced by using the gravity head in deep shafts (usually over 1500m deep) or by using one or more pumps in a pumpstation.

Pumpstations draw their water from the mine service water supply; this usually requires that is reduced in pressure and filtered. In some cases a water tank is used as a supply buffer and to collect recirculation water.

The pumps themselves can be of various sizes and configurations to suit the specific application. Multiple pump setups use electronic controllers to ensure efficient energy usage and to match output with demand.

Single pumps can be installed close to or within the working area.

Multiple pump systems are usually installed in a special cubby with ventilation, lighting and easy access.

Novatek can supply:

- **Powerpacks with high efficiency electric motors**, variable speed drives (VSD).
- **Booster pumps.**
- **Unloader valves** for single pump installations.
- **Water tanks with filling valves. Pressure reducing valves.**
- **Sand filter. Wedge wire strainers** and filters (to as low as 25 microns). These can be flushed while on-line and are also used for return water.
- **Electronic controllers** for multiple pump systems and VSDs.
- **Instrumentation.**

## Water Rockdrills



Novatek water rockdrills are the primary production tool within a hydropowered mining system. They are used to drill blastholes, roofbolt holes and holes for support and rigging. They can also be used to install and set roofbolts.

The drills can be used as jackdrills (ie hand-held, with a thrustleg) and as feed-mounted drills on one of our drilling rigs.

Novatek water drills have a high power-to-mass ratio, they are light but drill at least 2x faster than standard pneumatic and electric stoping drills. Their independent rotation mechanism also makes them much more effective when drilling in fractured ground.

The exhaust water from rockdrills can be recirculated back to the powerpacks to reduce the amount of water that is dumped to the footwall by 75%; only the flushing water portion flows into the working area. This flushing water volume is no more than that produced when drilling with either pneumatic or electric drills!

Novatek drills and drilling equipment are our own patented designs that we manufacture in-house. We provide full maintenance and backup support. The drills have been in commercial use since the late 1980s.

## Drill Rigs and Mechanisation



Novatek supply products that range from simple drilling jigs to mechanised drilling rigs for a range of applications, mainly using our hydro drills. We also deliver custom designs.

We believe in 'appropriate' mechanisation; machinery that is suitable to the mining environment, mine infrastructure and available skills and is cost effective. The objective is to increase productivity and safety, but not at the expense of sound economics.

Hydropower offers the ability to progress from hand-held drilling, to simple rigs, to larger rigs using the same underlying technology and mining hydropower system. This is due to the compactness and high power of hydraulics.

Standard products include:

- Simple stope rigs using drill feeds mounted on crossbeams attached to the temporary support.
- Stope roofbolters with remote operation
- T bar roofbolters for drilling in gullies etc.
- Small end development rigs for gullies, raises, etc.
- Large end development rigs
- Raise mining system – twin boom

Custom designs include:

- Shaft sinking stage with 4 pneumatic drills
- Excavator mounted feed drills
- Roofbolting rig mounted on a scissor lift for a utility vehicle
- Portable large end bolter.
- Hanging stope rigs
- Impact mining system (shown below)



## Hydropowered Equipment

Novatek provides a range of hydropowered tools (other than drills and rigs) for the working area, including:

- **Jetting guns** for fast and effective face cleaning. These can be supplied to suit required flowrates for use with and without face scrapers. Also useful for cleaning under conveyor belts and in metallurgical plants.
- **Hole cleaners** and desludgers are important for cleaning cuttings from blastholes and ensuring they are dry, especially if using ANFO. The numerous waterjets quickly clean the holes of debris, before sucking out all water.
- **Watering down guns** for general washing and cleaning; available with fixed nozzles or adjustable nozzles.
- **Utility guns/ valves** for on/off control of hydropower tools such as chainsaws.
- **Chainsaws** for rapidly and accurately cutting timber support.
- **Jet pumps** for removing wastewater. No electrical or compressed air and no fear of running dry.
- Linear motor for applications that require a very controllable but forceful linear motion. Used in the AEL emulsion explosives loader and also suitable for grout pumping.
- Staple tools.
- Pressure and flow testers.

## Services we Provide



Ensuring that our customers obtain benefit as much as possible from our products is important to us. We are specialists in our field and are able to provide additional services that add value and allow mines to concentrate on their business – mining!

### **PROJECTS AND DESIGN:**

- Novatek can provide project feasibility and design support, implementation, commissioning and training.
- We can deliver complete turnkey hydropower projects; from design to implementation.
- Development of custom designs to meet specific requirements; these include numerous drilling rigs, tools and mining systems.

## **MAINTENANCE:**

- We provide fully managed on-site maintenance support; on-site workshops operated under ISO 9001 quality system.

## **TRAINING:**

- We provide accredited surface and underground training, troubleshooting and support.

## **ONGOING IMPROVEMENT:**

- We believe in ongoing improvement to refine our products and services to meet our customers' changing needs.

