



A Rockwell Automation Company

Cubex Ltd. Cubex DTH 21 Automated Drill

The Client:

During the past 25 years, Cubex has been actively involved in the contracting of services, supplying of capital equipment, and designing and manufacturing equipment for the mining industry around the world. Their ultimate objective is to provide their customers the means to produce broken ore correctly sized. Cubex has designed a drilling machine to safely and efficiently drill long, accurate holes in any direction. Twenty-two years

ago, the company started out as a drilling contractor. Today, the company is still contracting its drilling services to the oil field industry by supplying men and equipment for specialized air drilling services around the world. Each Megamatic drill produced reflects the successful blending of engineering excellence with the application realities of the job site.

The Requirement:

Cubex designed a prototype automated drilling machine that would require less manual operator assistance, called the DTH 21 drill. Cubex required Hinz to work with their design team to provide electrical engineering and design services.

The DTH 21 consisted of several different major components, and two of these components, the carousel and the mast, are automated.

The carousel holds 24 drilling rods in total and is capable of

drilling a total depth of 150 feet. The mast contains all of the components required to complete the drilling operation, mainly the top drive, drilling rod breakout system, and the top drive feed control.

The ultimate goal was to create a piece of machinery that required less maintenance, and produced less downtime than previous designs.

The Design Solution:

The solution to automating the DTH drill consisted of an Allen Bradley SLC 5/03 in a 13 slot chassis with 5 discrete I/O cards, 3 analog I/O cards, a BAS-T RS-232 communications module, and a DeviceNet scanner card. Additional I/O used consisted of two different Flex I/O modules, and ArmorBlock I/O. The entire control platform was based on the DeviceNet system, and included 4 types of proximity switches, 2 different types of hydraulic valves, as well as a PanelView 1000 and a PanelView 300.

There are different modes of drill operation that are available to the operator. These modes include manual, semi-automatic, and automatic. When the operator is working in manual mode, they control all of the drill operations using the joysticks on the remote operator panel. When in semi-automatic mode, the operator will only control the actual drilling of the hole, and not the carousel functions that pertain to adding or removing drilling rods from the hole, and indexing the rods. In automatic mode, the operator will enter the required depth of the hole and the desired drill rotation speed. They will then use a joystick to select an automatic drilling mode, either "Drill to Preset Depth and Remove Rods", "Drill to Preset Depth Only", "Take Out Rods Only", "Feed In Rods Only".

The operator control station consists of a remote station on an industrial strength cart. The cart contains the PanelView 1000, several different types of joysticks, and a numeric keypad for screen control and numeric data entry. There are several different screens that are accessible to the operator. Depending on the desired mode of operation, the operator will select the corresponding screen.

There is also a PanelView 300 which is mounted on the rear of the machine that is used for diagnostic purposes. If there is an alarm, a horn will sound and an alarm light will illuminate, and the alarm condition will be displayed on both of the PanelViews. If something on the machine fails to operate or operates in a substandard condition, a message will be displayed on the PanelView 300 and an orange non-critical alarm light will illuminate. Most of these alarms are on a 60 second timer, and if the fault condition exists beyond the 60 seconds, the alarm becomes critical and the horn and red light comes on, and the machine is shut down.

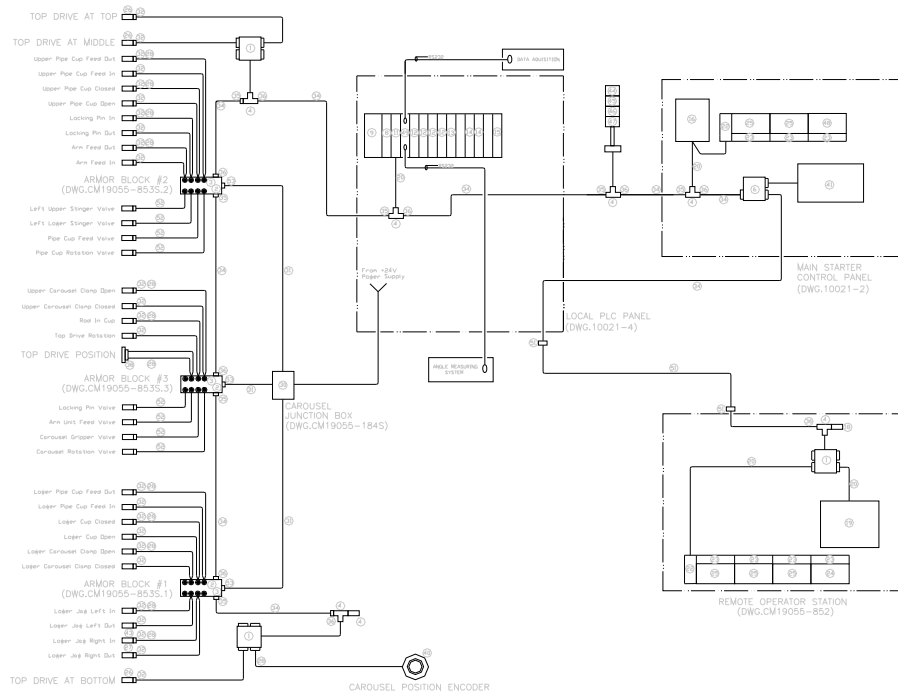
Other features of the Cubex DTH 21 drill is the Drill Sight 5 Laser set-up system. With this system, there are two lasers that come on during drill setup for operator assistance, and the angle of the swing and dump of the mast are displayed on the PanelView 1000 screen. Another feature is recording of drilling parameters such as rotation speed, feed rate, and hole depth onto a 40 MB hard drive for future troubleshooting. Both of these instruments talk to the PLC over RS-232 standards and are connected to the BAS-T module.

Currently the DTH 21 is only capable of drilling one hole at a time in automatic mode. There are already future considerations for further automation of the drill which will include the ability to program multiple holes and have the drill complete the holes without any operator intervention.



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System Specifications:

- SLC 5/03 Processor
- 2 – 4 Channel Analog Output Modules
- 1 – 8 Channel Analog Input Module
- 1 – 16 Channel Discrete Input Module
- 4 – 16 Channel Discrete Output Modules
- BAS-T Module for RS-232 Communications
- 6 – 16 Channel Flex I/O Discrete Input Modules
- 1 – 4 Channel Flex I/O Analog Input Module
- 1 – 16 Channel Flex I/O Discrete Output Module
- PanelView 1000 Color Touch Screen
- PanelView 300 with Keypad
- 33 Inductive Proximity Sensors
- 1 – Linear Length Transducer
- 1 – 12 Bit Absolute Encoder
- 50 Hydraulic Solenoid Valves
- Drill Sight 5 Laser Angle Measurement System
- Drill Parameters Recording System
- 8 – Hydraulic Pressure Transducers
- 3 – Analog Joysticks
- 7 – Discrete 2 way Joysticks
- 1 – 4 way Joystick with rocker switch

For further information or to contact a Hinz office near you, please check our website at:

www.hinz.com