

Green Lands
West Virginia Mining
and Reclamation Association
1624 Kanawha Blvd., East
Charleston, WV 25311

Address Correction Requ

JEFF SKOUSEN
MVP PLANT & SOIL SCIENCES
1106 PG. SCIENCES
90552 AM, MOUNTAINVIEW, WV 26040

Bulk Rate
U. S. Postage
PAID
Permit No. 1
Ravenswood, WV

DEMAG H135-S



JOB REPORT #1 DEMAG H135-S

SPECIFICATIONS	
Total Operating Weight:	308,000 lbs.
Bucket Capacity:	13.6 cu. yds.
Engine:	CAT 3412
# of Hydraulic Pumps:	3
Crowd Force:	132,300 lbs.
Breakout Force:	132,300 lbs.
Fuel Consumption:	24 gallons per hour

When a 10,000 ton per month coal operator in central West Virginia wanted to increase production to 30,000 tons per month, Beckwith had the answer.

The DEMAG H135-S boasts significantly reduced operating and maintenance costs with less than half the operating components of the industry's traditional two-engine excavators.

The compact dimensions of the DEMAG H135-S make it ideal for tight working quarters such as multi-seam steep slope contour coal mining. It's the perfect solution for areas where other equipment can become "spoil bound" and maneuvering is often limited due to narrow pits. The DEMAG H135-S is extremely fast,



maintaining cycle times under 25 seconds even under difficult digging conditions. The bucket fills easily, enabling 85-ton trucks to be filled in 4 passes.

With fewer parts to wear or break, the excavator's one engine and three main pumps provide the coal operator with efficient performance, increased availability and lower operating costs.

DEMAG hydraulic excavators are backed by DEMAG's efficient, reliable parts and service organization, with a 24-hour hotline, that gives you the parts, service and training you need, when and where you need it.

The DEMAG H135-S can help you write your own success story. It's available from Beckwith Machinery Company today. For more information, call 412-327-1300 or write Beckwith Machinery Company, P.O. Box 8718, Pittsburgh, PA 15221.

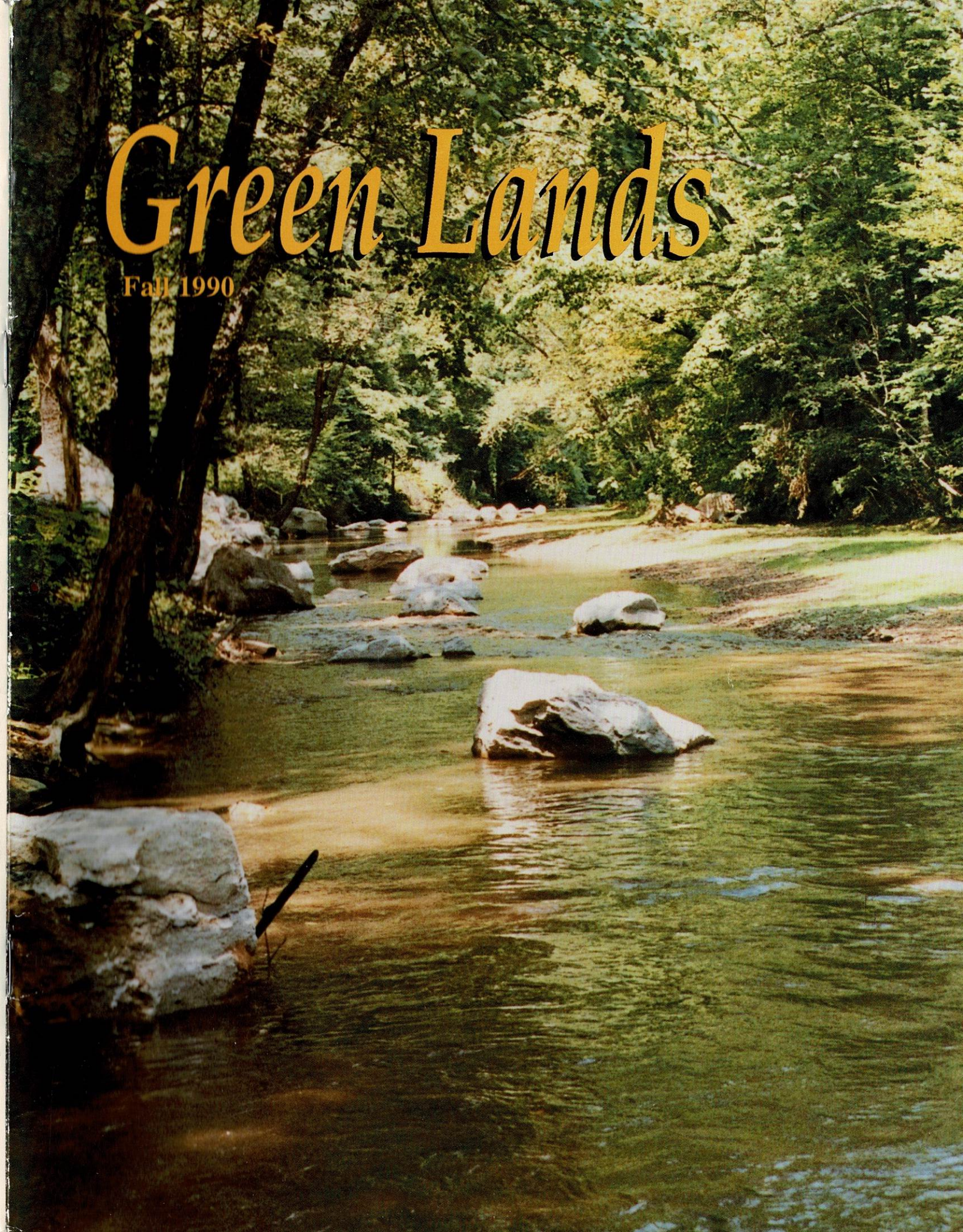
MANNESMANN
DEMAG

BECKWITH
Machinery Company



Green Lands

Fall 1990



AMERICA'S ENERGY AGENCY

With ecological considerations figuring prominently in the energy picture of the 90s, Flat Top's account executives work closely with the industry to assist with the myriad of requirements surrounding permitting, production, and reclamation phases of the mining process.

Working with the coal industry is nothing new to Flat Top. Our roots are buried deep within the history of our nation's coal industry. While energy-related insurance has been our trademark, we have expanded our products and services over the years to encompass all phases of insurance protection for a growing, complex marketplace.

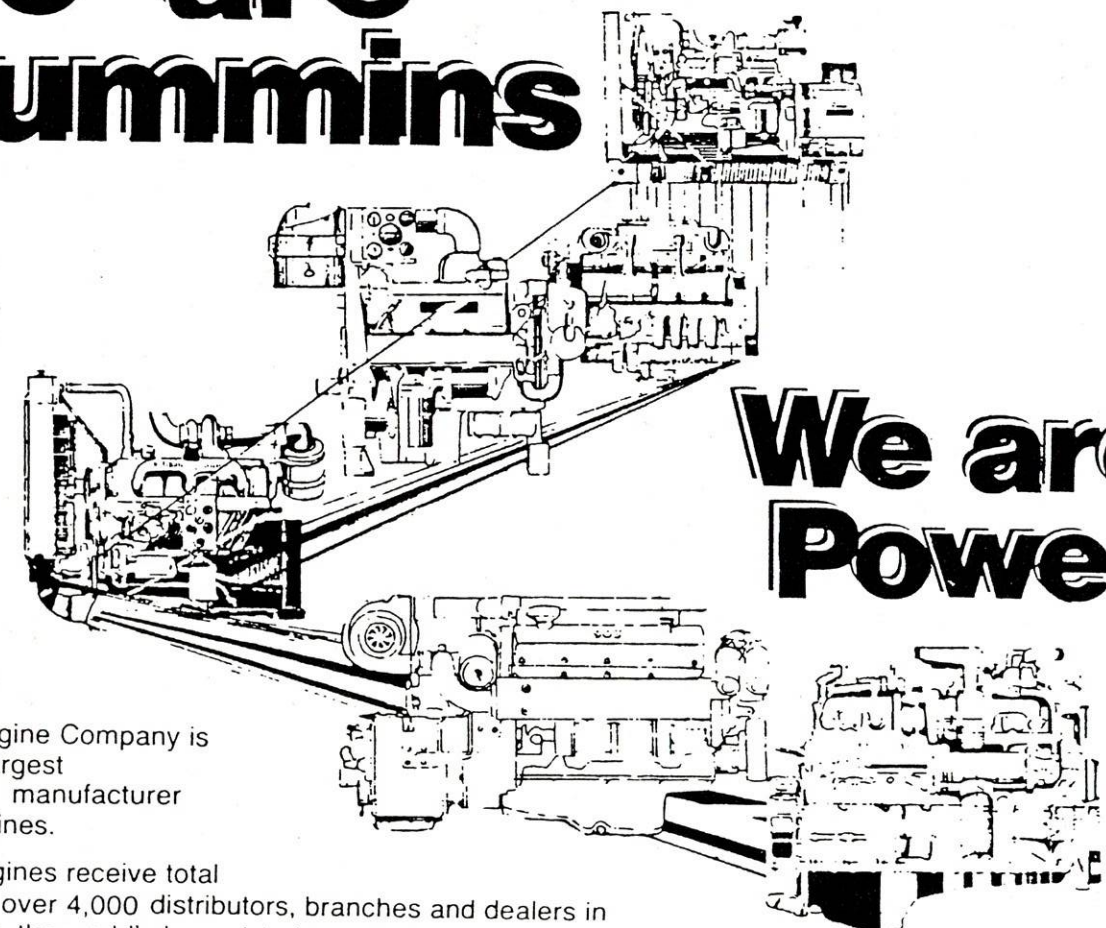
Energy insurance — yesterday, today, and tomorrow. Advantage Flat Top.



Bluefield, WV • 304/327-3421
Charleston, WV • 304/346-0414
Morgantown, WV • 304/598-3660
Princeton, WV • 304/425-2176
St. Clairsville, OH • 614/695-1596
Knoxville, TN • 615/637-0311
Bristol, VA • 703/466-9121
Grundy, VA • 703/935-2486
Pearisburg, VA • 703/921-1198
Wise, VA • 703/328-8828
Birmingham, AL • 205/879-8604

Walter P. Walters:
Pikeville, KY • 606/437-7361
Inez, KY • 606/298-3098
Richmond, KY • 606/623-6234

We are Cummins



We are Power

- Cummins Engine Company is the world's largest independent manufacturer of diesel engines.
- Cummins engines receive total support from over 4,000 distributors, branches and dealers in 135 countries, the world's largest independent diesel sales and service network.
- Cummins vast Research and Engineering Center at Columbus, Indiana, includes 88 fully instrumented test cells, experimental machine shop, engine rebuild and teardown areas, scientific laboratories, and a customer application center.
- Cummins construction diesels have long been a preferred source of power for a wide range of applications in off-road vehicles and equipment. More than 1300 types of equipment worldwide offer Cummins as either specified power or as a premium option.
- Cummins automotive diesels—the standard of the industry—have been proven in billions of miles of heavy duty highway service. Cummins diesels power more long-haul trucks than all other makes combined.

Cummins Diesels for:

- On-Highway Trucks
- Construction
- Electric Generator Sets
- Mining • Marine
- Agriculture • Buses
- Fire Apparatus
- Stationary Power
- Rail Engines

Cummins
Cumberland
Inc.

Nashville, TN
(615) 366-4341

Knoxville, TN
(615) 523-0446

Louisville, KY
(502) 491-4263

Hazard, KY
(606) 436-5718

Bristol, VA
(703) 669-4200

Evansville, IN
(812) 425-2464

Fairmont, WV
(304) 367-0196

South Charleston, WV
(304) 744-6373

Crown Hill Equipment, Inc.

We have the following items in stock for exchange or outright sale:

- 992C - 13.5 cubic yard Rock Bucket
- 992C - Upper and Lower oil sealed bucket pins
- 992C - Lift, tilt and steering cylinders
- Hydraulic cylinders for 988 / 988B / 777 / 769 / 773 / D9G&H / D8H&K / D8L / D9I
- Exchange final drives for D9H S/N/ range 90V and up
- Exchange D9H - 19K "U" blade
- Rebuilt D9H push arms
- We also have access to a wide range of "take off" parts (planetaries, axles, engines, transmissions, torques) for all makes of Cat equipment.
- Hydraulic pumps and motors for Cat equipment along with a complete line of "wear" parts (bucket teeth, cutting edges, adapters, rollers, tracks, etc.)

 **Crown Hill Equipment, Inc.**
Route 61 - Crown Hill, WV 25052
(304) 595-4111
Now Toll Free 1 - 800 - 950-4445

DEMAG MACHINE LOCATIONS West Virginia

BECKWITH AND DEMAG LOCATIONS

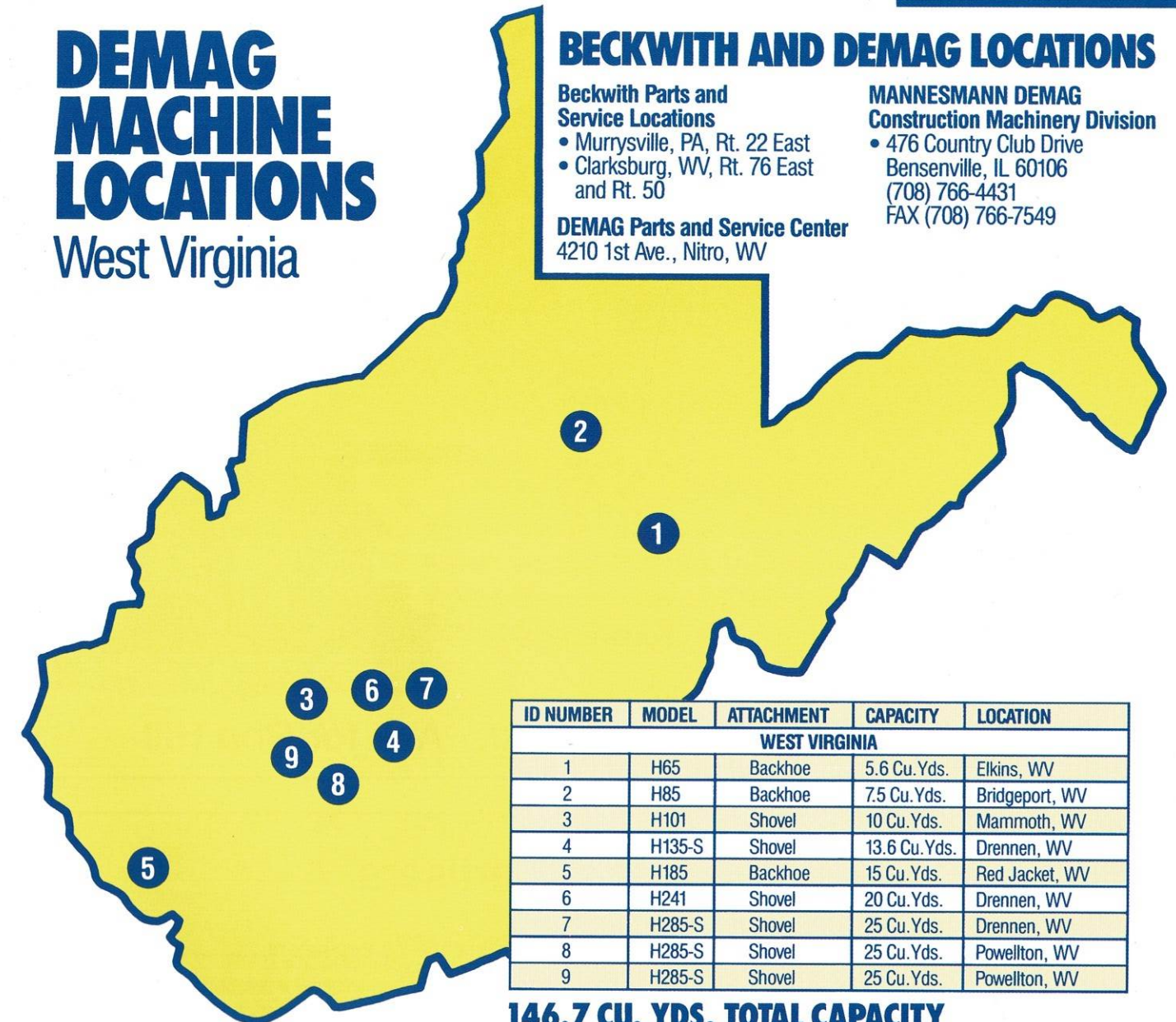
Beckwith Parts and Service Locations

- Murrysville, PA, Rt. 22 East
- Clarksburg, WV, Rt. 76 East and Rt. 50

DEMAG Parts and Service Center
4210 1st Ave., Nitro, WV

MANNESMANN DEMAG Construction Machinery Division

- 476 Country Club Drive Bensenville, IL 60106
(708) 766-4431
FAX (708) 766-7549



146.7 CU. YDS. TOTAL CAPACITY
109.2 CU. YDS. CAPACITY SINCE 1987

WEST VIRGINIA IS BECKWITH COUNTRY

**MANNESMANN
DEMAG**

BECKWITH 
Machinery Company

P.O. BOX 8718 • PITTSBURGH, PA 15221
412-327-1300 • FAX 412-327-9318

PENN LINE SERVICE, INC.



Need Hydro-Seeding & Mulching of Surface Mine Areas, Silt Ponds, Roads, Etc?
PENN LINE will Restore natural Beauty.

CALL TOLL FREE 800-333-9110. Ask for Ron Hill

Index to Advertisers

Akers Supply.....	44	Kanawha Steel & Equipment.....	8
Anderson of West Virginia.....	26	Lilly Explosives.....	41
Atlas Powder.....	19	Massie Reclamation.....	14
Austin Powder.....	38	McDonough Caperton.....	9
Beckwith Machinery.....	back cover	Mt. State Bit Service.....	15
Beckwith Machinery.....	3	Nell Jean Enterprises.....	40
Bell Farms Reclamation Service.....	38	Noble' Group Benefits.....	42
Carter Machinery.....	40	Ohio Seed.....	14
Chamberlaine & Flowers.....	30	Peerless Enterprises.....	44
C. I. Walker Machinery.....	22	Penn Line Service.....	4
Crown Hill Equipment.....	2	Petroleum Products.....	15
Cummins Cumberland.....	1	Rish Equipment.....	inside back cover
Flat Top Insurance.....	inside front cover	Rudd Equipment.....	10
Fullen Fertilizer.....	15	Scarlet Oaks.....	44
GAI Consultants.....	44	Steel Supply.....	42
Green Acres Contracting.....	37	Terra Engineers.....	42
Gunter Reclamation.....	42	West Virginia Explosives.....	19
Hotsy Equipment.....	30	West Virginia Tank Testing.....	42
J & G Seeding.....	40	Worldwide Equipment.....	39

Green Lands

Volume 20 Number 4

- 6** WVMRA Members Help Create Trout Stream
- 11** Penn Line Service is Golden
- 24th Annual Meeting**
- 16** New Association Chairman is Ken Woodring
- 18** WVMRA Honors C. E. "Jim" Compton
- 24** Scenes from The Greenbrier
- 27** Company Pride
- 31** Acid Mine Drainage Treatment Systems:
Chemicals & Cost
- 43** Coal Calendar

Green Lands

is a quarterly publication of the
West Virginia Mining & Reclamation Association,
with offices at 1624 Kanawha Boulevard East
Charleston, West Virginia 25311
(304) 346-5318



Our Cover

Pond Fork Creek in
Boone County is West Virginia's newest
trout stream. All it took was a good
idea and a little cooperation.
Our cover story is on page 6.

WVMRA Staff & Board of Directors

President
Benjamin C. Greene

Vice President
William B. Raney

Assistant to the President
Patty Bruce

Business Manager
Mary Ann Steele

Editor
Daniel Miller

Chairman
Kenneth G. Woodring - Huntington
First Vice Chairman
R. Donald Cussins - Bayard
Second Vice Chairman
James J. LaRosa - Clarksburg
Secretary
Donald K. Cooper - Charleston
Treasurer
Gerald W. Ramsburg - Clarksburg
Associate Division Chairman
Edward F. Surgeon - Louisville, KY

Directors
J. W. Anderson - Princeton
T. J. Brisky - Eighty-Four, PA
J. R. Bryan - Lebanon, VA
D. P. Cartwright - Naugatuck
J. M. Compton - Clarksburg
B. H. Daud - Yolen
B. E. Dearth, Jr. - Bridgeport
D. R. Donell - Weirton
J. J. Faltis - Morgantown
P. C. Graney, III - Charleston
J. H. Harless - Gilbert
D. E. Huffman - Bridgeport
J. E. Hull - Charleston
P. F. Hutchins - Columbus, OH
T. W. Hylton - Beckley
C. T. Jones - Charleston
J. C. Justice - Beckley
R. G. Lockard - Weston
J. W. Mullen - Bluefield
R. L. Raines - Bluefield
L. A. Streets - Mt. Storm
J. C. Williamson - Charleston
G. D. Woodward - Morgantown
S. R. Young, III - Gilbert
Honorary Members
C. E. Compton - Clarksburg
L. W. Hamilton, Jr. - Hansford
F. B. Nutter, Sr. - Pompano Beach, FL



Pond Fork Creek, a Coal River tributary in Boone County, will soon be home to trout and a haven for trout fishermen.

WVMRA Members Help Create Trout Stream

West Virginia Department of Natural Resources Director Ed Hamrick is a man who knows a good opportunity when he sees it.

An enthusiastic supporter of West Virginia wildlife, Hamrick has been especially interested in improving the quality and quantity of the state's trout streams.

In Boone County over the past year, Hamrick marshaled the forces of three community minded coal companies to put Pond Fork Creek on the West Virginia trout map.

Pond Fork, a tributary of the Coal River, was not polluted in the traditional sense. Following a community cleanup of trash and garbage, the trout potential was there, but some changes were needed.

The problem was one of depth, or lack of it. The meandering stream was too shallow to be hospitable to trout, and lacked sufficient underwater hiding places.

With WV-DNR managing the project, Island Creek Coal Co., BethEnergy Mines, Inc. and Peabody Coal Co. rode to

the rescue. Six miles of Pond Fork were targeted for the upgrade. Island Creek, from its Holden operation, and BethEnergy, provided equipment and manpower to deepen the streambed, which in turn provided a faster flow, more suitable for trout.

Peabody supplied 100 truckloads of boulders from its Colony Bay surface mine near Barrett. Under the direction of DNR Assistant Chief Don Phares, the boulders were placed intermittently down the six miles of streambed to provide the underwater shelter that trout require.

With a deeper, faster stream, Pond Creek was narrower, necessitating the revegetation of its banks with grass seed donated by Island Creek.

The result is a picturesque, natural looking stream which will provide a hospitable habitat for the trout which will be stocked in time for the 1991 spring fishing season.

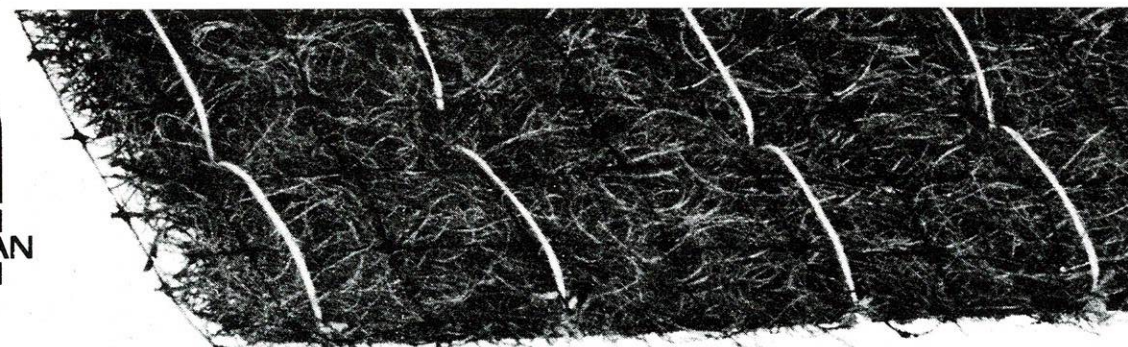
It's also a result in which DNR, the coal industry, and the surrounding community can all take great pride.



DNR Assistant Chief Don Phares directs an Island Creek bulldozer as it places a boulder in the Pond Fork streambed.



Expanded stream banks, formerly under water, were seeded to put the finishing touches on the project.

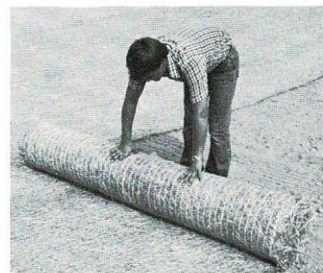


Shown
Actual Size

Control Erosion In Heavy Rains. Conserve Moisture When There Is No Rain.

North American Green offers a variety of Erosion Control Blankets to suit a variety of situations:

Just Roll It On



Starting at the top of the slope to be covered just unroll the Blanket. The Blanket should never be stretched so that contact with the soil can be maintained. Follow the simple instructions included with each roll.

Staple It Down



As you unroll the Blanket, staple it firmly to the ground using North American Green Surelock. Generally one staple per square yard will be sufficient. Under adverse conditions more staples might be required. Staple patterns are illustrated in the installation instructions.

Let Nature Do The Rest



North American Green Erosion Control Blankets create an ideal environment for seed to germinate. Because the Blankets are so well constructed, they help prevent the loss of moisture through evaporation, yet because the Blankets are porous, the ground will accept additional moisture through rainfall.

North American Green Products

\$75

Straw Blanket for moderate runoffs 4:1

\$150

Straw Blanket for heavy runoffs 3:1

SC150

Straw/Coconut Fiber Blanket for heavy runoff 2:1

SCC225

Straw/Coconut Fiber Blanket with seed for heavy runoff 2:1

C125

100% Coconut Fiber Blanket for extreme conditions and ditches.

P-300

100% Nylon Permanent Ditch Liner

Write or call North American Green for more information on the complete selection of Erosion Control/Revegetation Blankets.

Take the guess work out of erosion control.

CONTACT DISTRIBUTOR'S NEAREST BRANCH

KANAWHA STEEL & EQUIPMENT COMPANY

GENERAL OFFICES
3000 Sissonville Drive
Charleston, W.Va. 25332
P.O. Box 3203 Area Code 304 343-8801

BRANCH
Highway 70 East
Madisonville, Ky. 42431
P.O. Box 144 Area Code 502-821-2634

BRANCH
Old Route U.S. 23 North
Wise, Virginia 24293
P.O. Box 1437 Area Code 703 328-8096

BRANCH
Route U.S. 25 East
Middlesboro, Ky. 40965
P.O. Box 8 Area Code 606 248-2054

14649 Highway 41 North
Evansville, IN 47711

BRANCH
106 North Bridge Street
New Martinsville, W.Va. 26155
P.O. Box 288 Area Code 304 455-3430

BRANCH
1517 Mellwood Avenue
Louisville, Ky. 40201
P.O. Box 32 Area Code 502 589-6278

BRANCH
Route U.S. 23 North
Prestonsburg, Ky. 41653
P.O. Box 126 Area Code 606 886-8123



Service is the cornerstone of our business.

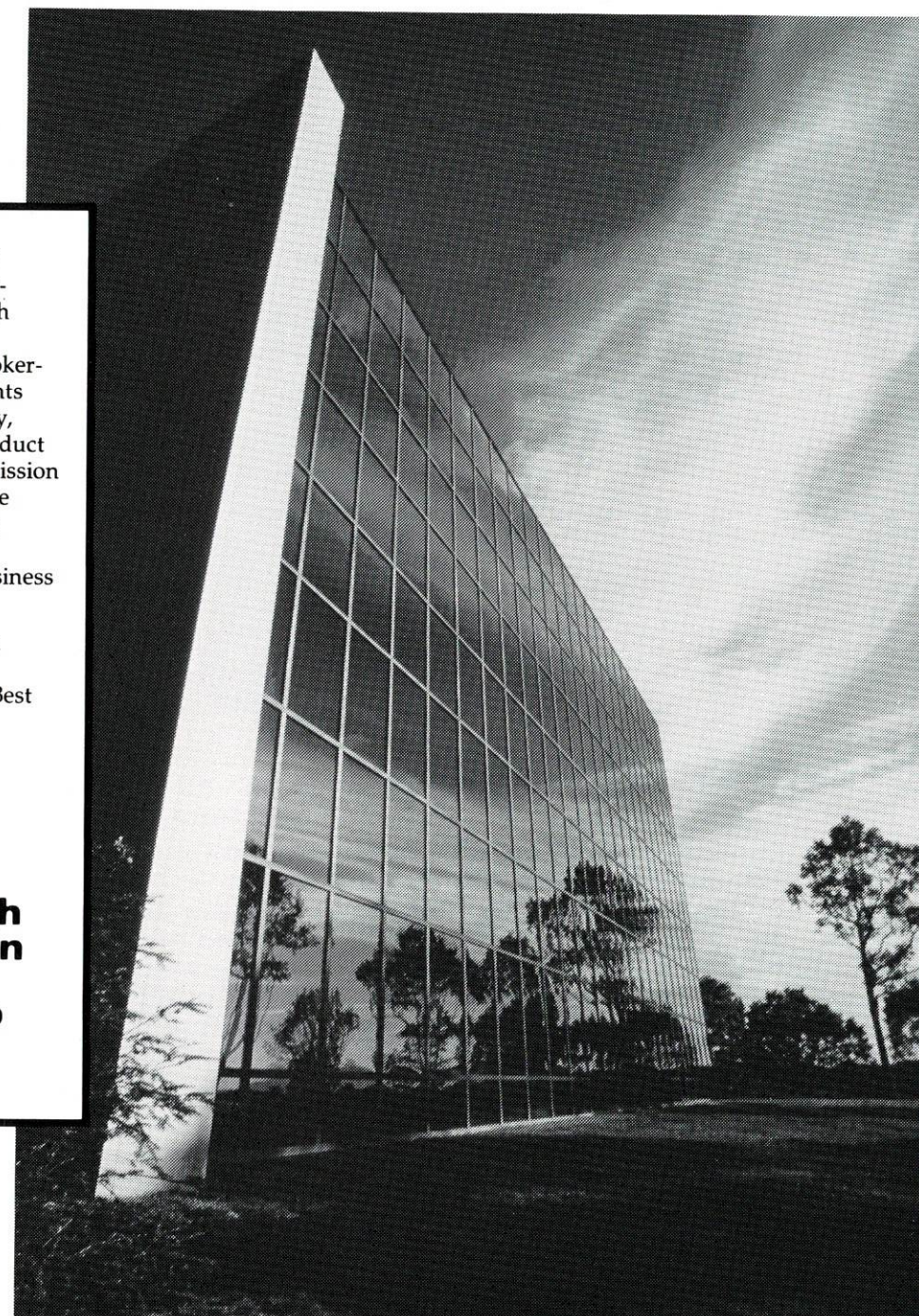
Upon a foundation of experience and professionalism, McDonough Caperton has built a regional insurance brokerage firm assisting clients nationwide. Ultimately, service is the only product we have to sell. Our mission to provide a distinctive service of outstanding value will remain the cornerstone of our business as we move forward.

McDonough Caperton
Insurance Group —
committed to be The Best
There Is!

**McDonough
Caperton
Insurance
Group**

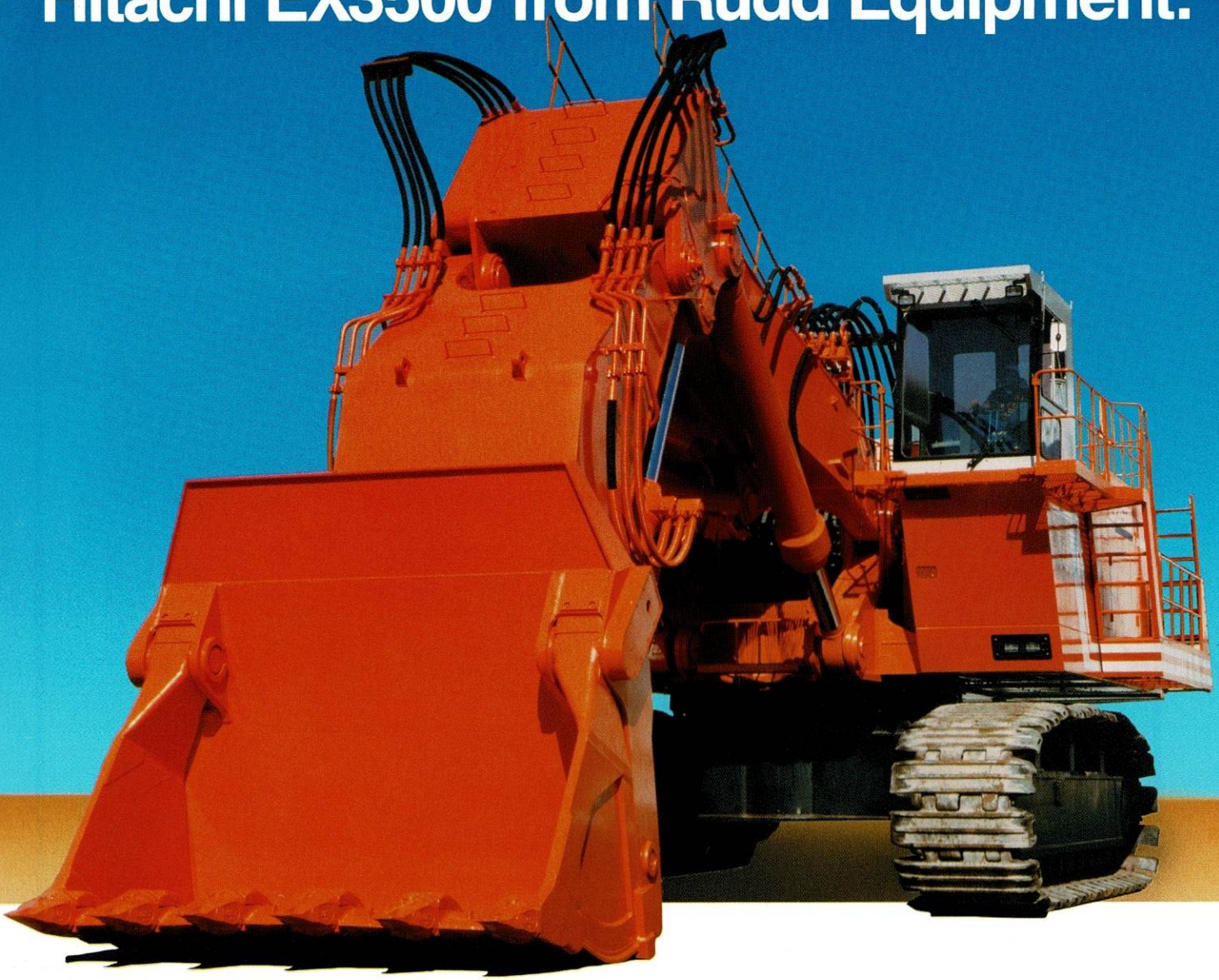


Service
is the cornerstone
of our business.



Corporate Headquarters One Hillcrest Drive, East, P.O. Box 1551, Charleston, WV 25326-1551, Telephone: (304) 346-0611 Fax: (304) 347-0697
With Offices Located in: Florida, Georgia, Kentucky, Ohio, Pennsylvania, Virginia, West Virginia and Bermuda

When reliability counts, count on the Hitachi EX3500 from Rudd Equipment.



The Hitachi EX3500 hydraulic shovel means rugged, reliable performance and high availability that you can count on. That's why so many mine managers, owners, engineers and operators talk to Rudd Equipment for their mining machinery needs.

Extra durability all-around. Like all Hitachi products, the EX3500 features unmatched durability all-around. Extra durable front attachments, an extra tough undercarriage and more will give you high availability.

Reliable hydraulics. The EX3500 incorporates advanced, high-speed hydraulics that provides the reliability that will make your jobs simpler, faster and more productive. In addition, the EX3500 utilizes newly designed electronics and hydraulics systems

that ensure extremely smooth and productive operations.

This chart shows you why:

Weight	Horsepower	Bucket PCSA heaped	
		Shovel	Backhoe
723,000 lbs.	1,684 PS	23.5-32.7 cu. yd.	22.2-32.7 cu. yd.

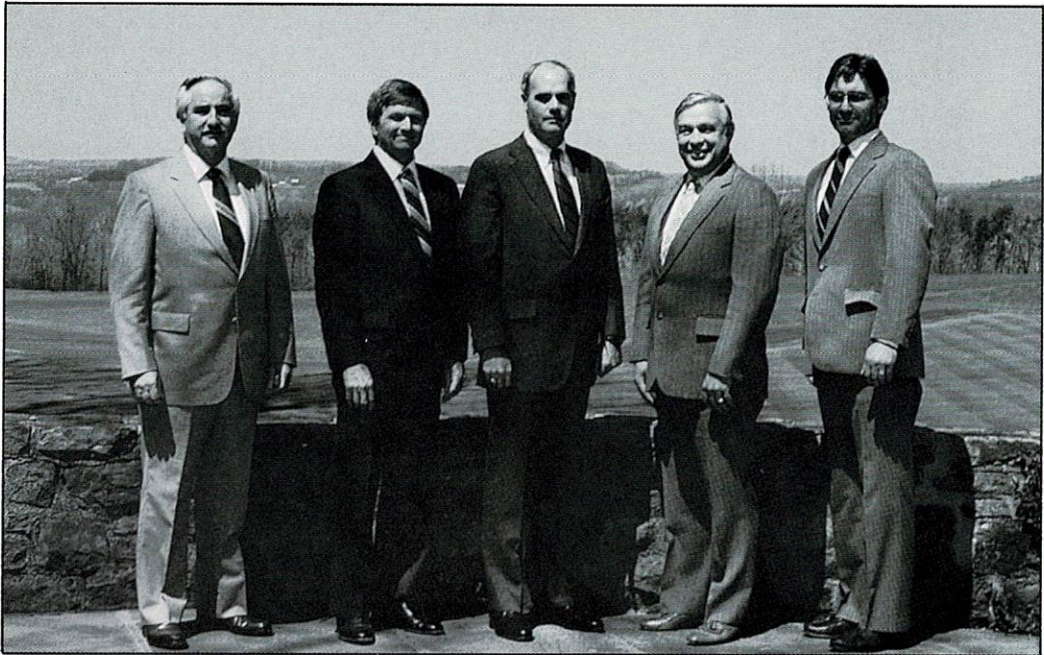
Rudd reliability throughout. Rudd Equipment is a powerful partner in the tough business of producing coal. That means a total commitment to fast, helpful parts and service response to keep your EX3500 productive and profitable.

To find out how Rudd can make the difference for you, call one of our offices today.

Louisville, KY (502) 456-4050	Evansville, IN (812) 867-6661	St Louis, MO (314) 487-8925
Corbin, KY (606) 528-9440	Indianapolis, IN (317) 247-9125	Pittsburgh, PA (412) 322-1112
Allen, KY (606) 886-1276	Fort Wayne, IN (219) 482-3681	Clearfield, PA (814) 765-8500

Nitro, WV
(304) 755-7788
Bridgeport, WV
(304) 592-1050

RUDD
EQUIPMENT COMPANY
*The Rudd difference is performance.
Experience it for yourself.*



Penn Line's leadership for the 1990's -- (l-r) Reclamation Supervisor Dave Young, Vice President Larry Roberts, President H. I. Penn, III, Vice President Sterl Dean, and Vice President Paul Mongell.

50th Anniversary in 1990 Penn Line Service is Golden

Penn Line Service, Inc. is one of WVMRA's best kept secrets. With significant operations outside the coal industry, and outside West Virginia, Penn Line Service is one of the biggest, oldest, and most successful businesses on the Association rolls.

In 1990 the company celebrates its 50th business anniversary.

Penn Line got its start in 1940 from William Cheesman, who put together a telephone crew of one truck and several linemen and went to work for constructing phone lines for Bell of Pennsylvania. Chessman managed the operation from his dining room in Scottdale, PA.

By 1942, he was headquartered on the second floor of the local First National Bank. With the end of World War II, and the beginning of the post-war industrial boom, Penn Line was ready.

Cheesman took as his partner one Robert "Pappy" Reese, who got the company into the business of tree trimming, as well as right-of-way projects. In the early 1950's, the company rapidly moved forward.

Penn Line Service was organized into a corporation,

with Reese as chairman and Cheesman as president. Utility work was expanded, the company began purchasing its own equipment, and the Forest Construction subsidiary was formed to bring Penn Line into contact with the coal business.

Previously a western Pennsylvania company, business borders were extended into central Pennsylvania and West Virginia.

The onset of the federal interstate highway construction program in 1956 brought with it another period of expansion for Penn Line. Major contracts were obtained planting honeysuckle and crown vetch on the slopes of the highway cuts. During this period, Penn Line pioneered the use of a power driven hydroseeder, and later expanded its service to guardrail installation.

Soon the company moved into its own offices in downtown Scottdale. As Penn Line moved into the 1960's, the second generation of leadership took the company into new business areas. Under the presidency of Howard Ferguson, Penn Line became involved with mine reclamation, utilizing helicopters for spraying and seeding.



By the close of World War II, Penn Line Service was a thriving company, with several construction crews on the job, and leadership which was ready for the challenges of the U. S. post-war building boom.

In the 1970's, Penn Line's growth was stymied, first by the nationwide recession, and then by the unexpected death of its president, Howard Ferguson. Though near retirement, Vice President Robert Fite stepped into the breach and, in his two year tenure, concentrated on reestablishing the company's financial stability. In 1977, Robert Wingert took the reins and prepared Penn Line for another spurt of growth in the 1980's. In 1984, Penn Line acquired Tri-County Electric, based in Elkins, WV.

By 1987, with a "third generation" of leaders in command, Penn Line's steady growth over the decades dictated the creation of a "Corporate Service Group," consolidating all the company's business support functions such as personnel, safety, regulatory compliance, etc.

In 1989, the Scottdale office building was completely

and beautifully refurbished in a manner befitting a thriving company which now boasts nearly 1,000 employees and 300 customers over a 15 state region.

From a single leased truck in 1940, the Penn Line Service of 1990 now deploys a fleet of more than 800 road and off-road vehicles, with an in-house maintenance facility.

The Penn Line Service of current President H.I. Penn, III is a multi-divisional specialty contractor performing line construction, tree trimming, right-of-way maintenance, mine reclamation, landscaping, coal mine electric contracting, and specialty electrical design and installation.

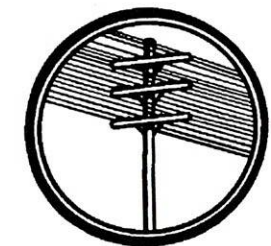
In a half century of service and growth, Penn Line Service, Inc. has marked itself as one of the Association's outstanding members.



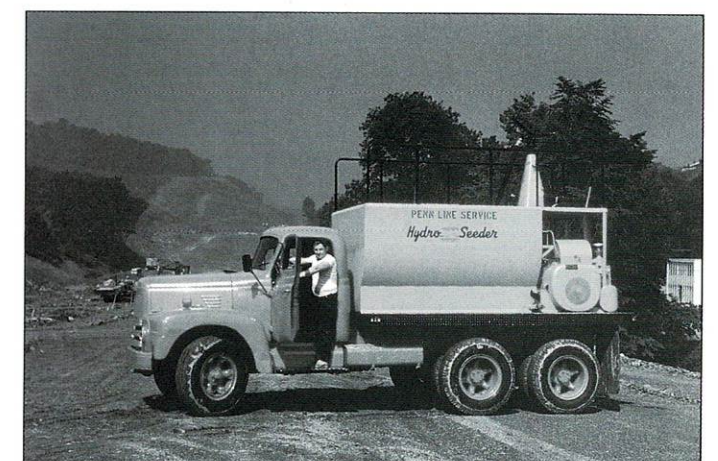
As much as anyone, Jeanne Koch symbolizes the history of Penn Line Service. She started as a secretary/bookkeeper in 1950, and is now the payroll manager.



PENN
LINE SERVICE INC.



Penn Line Service started as a telephone line construction company.



Later, the company helped pioneer the use of mechanized hydroseeding.

Stand back and
Watch Us Grow!

Massie Reclamation, Inc.

We specialize in

- hydroseeding
- tree planting
- straw blowing

P. O. Box 396
Shady Spring, West Virginia 25918

Charles Massie, Owner
(304) 787-3933

Depend upon
The Ohio Seed Company
for all reclamation seed
high quality and prompt delivery



TOLL FREE
1-800-336-7333

The Ohio Seed Company
P.O. Box 87
West Jefferson, Ohio 43162
(614) 879-8366

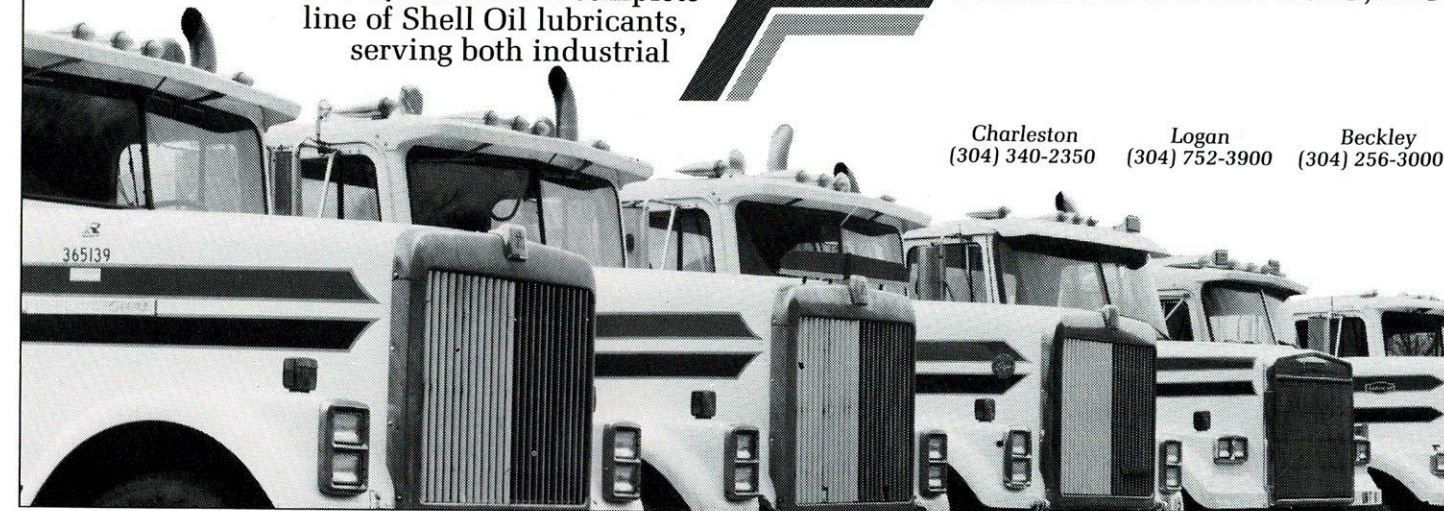
On the move for 50 years.

"Oil is our product, service is our business" is not just a saying at Petroleum Products, Inc. — it's a way of life. Since 1938, we've served the oil needs of coal and other industries in southern West Virginia. Today Petroleum Products, Inc. is a major full-line distributor of Chevron Oil Products and handles a complete line of Shell Oil lubricants, serving both industrial

and retail outlets. We've been on the move for 50 years and we're changing to meet the ever increasing demands of the 1990's. Call us. We're here to serve your needs.

PETROLEUM PRODUCTS, INC.

Charleston (304) 340-2350 Logan (304) 752-3900 Beckley (304) 256-3000



Fullen
Fertilizer Company, Inc.

Fertilizer
Hydromulch
Seeds

Custom Fertilizer Formation
Soil Testing & Quality Delivery Service

Contact
Tim Fullen

P.O. Box 172
Union, WV 24983
(304) 772-3088



MT. STATE BIT
SERVICE, INC.

P.O. BOX 4300, MORGANTOWN, WV 26505
(304) 296-1783

- COMPLETE LINE OF EXPLOSIVES
- COMPLETE LINE OF ACCESSORIES
- CONTRACT DRILLING SERVICES
- CONTRACT BLASTING SERVICES
- MIX PLANT FACILITIES FOR
PACKAGING OF BAGGED ANFO
AND WET HOLE STICKS WITH
VARIOUS DENSITY AND ENERGY

MORGANTOWN, WV
HUNTINGTON, WV

GRANTSVILLE, MD
FAIRBANKS, PA

PROMPT & DEPENDABLE



Ken Woodring - WVMRA Chairman for 1990-91

WVMRA Past Chairmen

1966-67	Leo Vecellio, Sr.
1967-68	F. B. Nutter, Sr.
1968-69	Arch F. Sandy, Jr.
1969-70	John C. Anderson
1970-72	G. B. Frederick
1972-73	James L. Wilkinson
1973-74	Lawson W. Hamilton, Jr.
1974-75	James C. Justice, Sr.
1975-76	H. L. Kennedy
1976-77	Frank D. Jennings
1977-78	James H. Harless
1978-79	John J. Faltis
1979-80	Charles T. Jones
1980-81	Lawrence A. Streets
1981-82	William C. M. Butler, III
1982-83	Donald R. Donell
1983-84	Tracy W. Hylton
1984-85	Carl DelSignore
1985-86	Dwight M. Keating
1986-87	Theodore J. Brisky
1987-88	James W. Anderson
1988-89	Roy G. Lockard
1989-90	Paul F. Hutchins

New Association Chairman is Ken Woodring

Some 500 members and guests defied bleak weather forecasts and made a success of WVMRA's 24th Annual Meeting at the Greenbrier Hotel in early August.

In addition to electing a new slate of officers for the Association's Silver Anniversary celebration next year, the membership met with new WV-DoE Commissioner Larry George, got a preview of the Legislature's special session on education, and an update on the UMWA retiree health benefits issue.

In and around the meetings, champions were crowned in golf, tennis, bowling, trap shooting, fishing, and "fun running."

"Monte Carlo Night," children's programs, spouses' programs, and the traditional Coal Miners' Party on Kate's Mountain rounded out the activities.

New Chairman

Kenneth G. Woodring is the new Chairman of the WVMRA Board of Directors.

Ken is the Senior Vice President of Operations of Ashland Coal Co., Inc. in Huntington. He was elected to a one-year term at the Association's 24th Annual Meeting, succeeding **Paul F. Hutchins** of Freeman Branch Mining.

Ken is a native of Allentown, PA, and a mining graduate of Penn State University. Following graduation, he spent five years with Greenwich Collieries before moving to Ashland Coal in 1977. Later that year he was assigned to Hobet Mining, Inc., an Ashland subsidiary. He was named president of Hobet in 1983, and assumed his current post with the parent company in 1989.

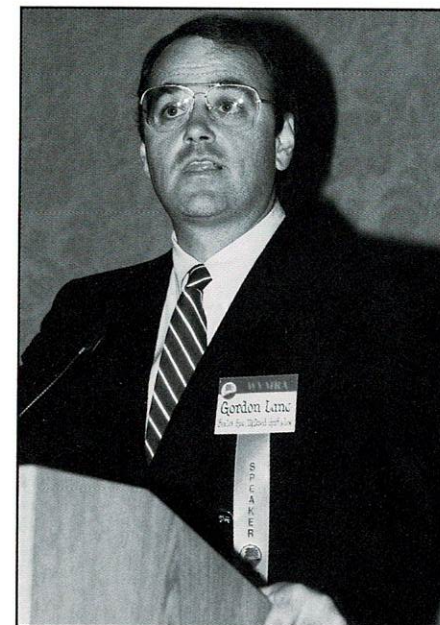
During the past year, Ken served WVMRA as first vice chairman. He was first elected to the Board in 1987, serving a one year term as treasurer. He also was elected second vice chairman in 1988.

Other New Officers

Replacing Ken as First Vice Chairman is **R. Donald Cussins**, president of Buffalo Coal Co., Bayard. Don, who served as Second Vice Chairman last year, was in turn replaced by **James J. LaRosa** of LaRosa Fuel Co., Clarksburg.

Donald K. Cooper of Princess Susan Coal Co. of Charleston will assume the post of Secretary for 1990-91. The new Treasurer will be **Gerald Ramsburg** of C&W Coal Co., Clarksburg.

Edward F. Surgeon of Cummins Cumberland, Inc.,



Education Reform
Gordon Lane - Task Force Chairman



UMWA Retiree Benefits-Interim Report
Forrest Roles - Smith, Heenan & Althen



Changes at West Virginia DoE
Larry George - WV-DoE Commissioner

Technical Session Speakers

Louisville, KY, was elected Chairman of the Associate Division. Surgeon is a long-time member of WVMRA and a former member of the Board of Directors.

Board Members

Six members of the Board were re-elected to three year terms, in addition to Gerald Ramsburg. These include **James W. Anderson** of Anderson & Anderson Contractors, Princeton; **Theodore J. Brisky** of BethEnergy Mines, Inc., Eighty-Four, PA; **James M. Compton**, Grafton Coal Co., Clarksburg; **Ben H. Daud**, Arch of West Virginia, Yohyn; **John J. Faltis**, Anker Energy Corp., Morgantown, and **Tracy W. Hylton**, Perry & Hylton, Inc., Beckley.

Ed Surgeon and two other members were newly elected to three year terms. The new Board members are **Don Woodward**, Mt. State Bit Service, Inc., Morgantown and **Jay W. Mullen**, Rish Equipment Co., Bluefield.

New Members

Eleven companies were approved for WVMRA membership at the recent Annual Meeting, including four in the General Division and seven in the Associate Division. Welcome to the following new members:

GENERAL DIVISION-Ashland Coal, Inc., Huntington, Kenneth G. Woodring - representative; **Big Otter Coal Corp.**, Southern Pines, NC, J. Daniel Butler - representative; **Coal Valley Mining, Inc.**, Mullens, Donald W. Fink, Jr. - representative; **Smithers Coal & Dock, Inc.**, Sprague, John L. Lancianese - representative.

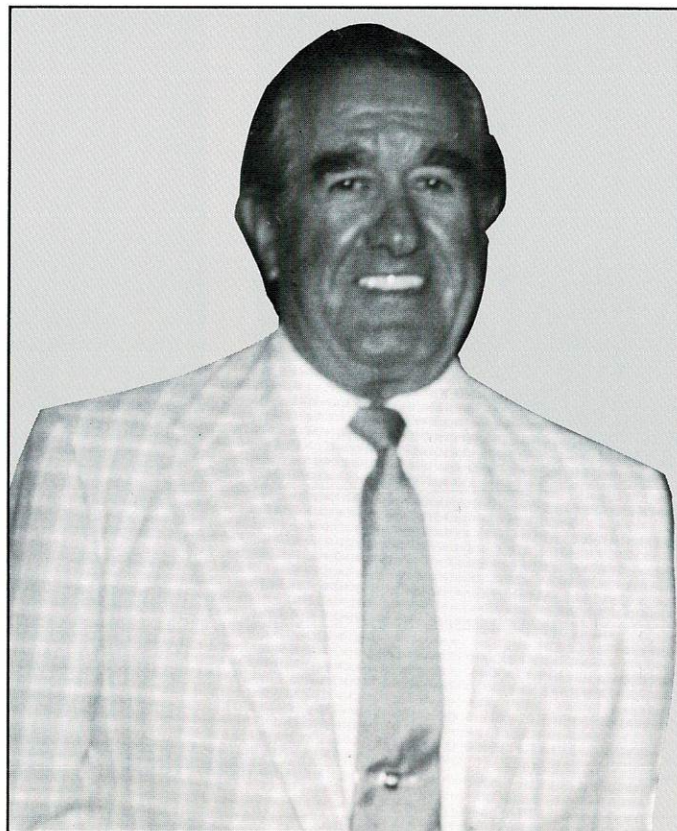
ASSOCIATE DIVISION-Buckhanan Explosives, Inc., Vansant, VA, Larry Grant Shrader - representative; **Lanham, O'Dell & Co.**, Hurricane, Robert L. O'Dell - representative; **Linville's Coal Preparation Plant, Inc.**, Oceana, Howard Linville - representative; **Martin Financial Services**, Charleston, Tom Martin - representative; **Mellon Bank, N.A.**, Pittsburgh, PA, Robert E. Heuler - representative; **PM Enterprises, Inc.**, Poca, Shannon Westerman - representative; **Tygart Resources, Inc.**, Pittsburgh, PA, Thomas E. Blandford - representative.

Next on the Agenda

The Board will reconvene at the Lakeview Resort in Morgantown for its fall meeting November 2-3. Members are invited and encouraged to attend the fall gathering, which will include the West Virginia - Penn State football game.



On behalf of his father, James Michael Compton accepts the plaque from Lawson Hamilton.



C. E. "Jim" Compton.

Honorary Board Member

WVMRA Honors C. E. 'Jim' Compton

C. E. "Jim" Compton became WVMRA's third Honorary Member of its Board of Directors in a ceremony at the closing banquet of the Association's 24th Annual Meeting.

Simultaneously, WVMRA established the West Virginia Mining & Reclamation Endowment Fund, with an initial gift of \$10,000.

Jim Compton is well known as a founding member of WVMRA and as a sustaining force throughout its history.

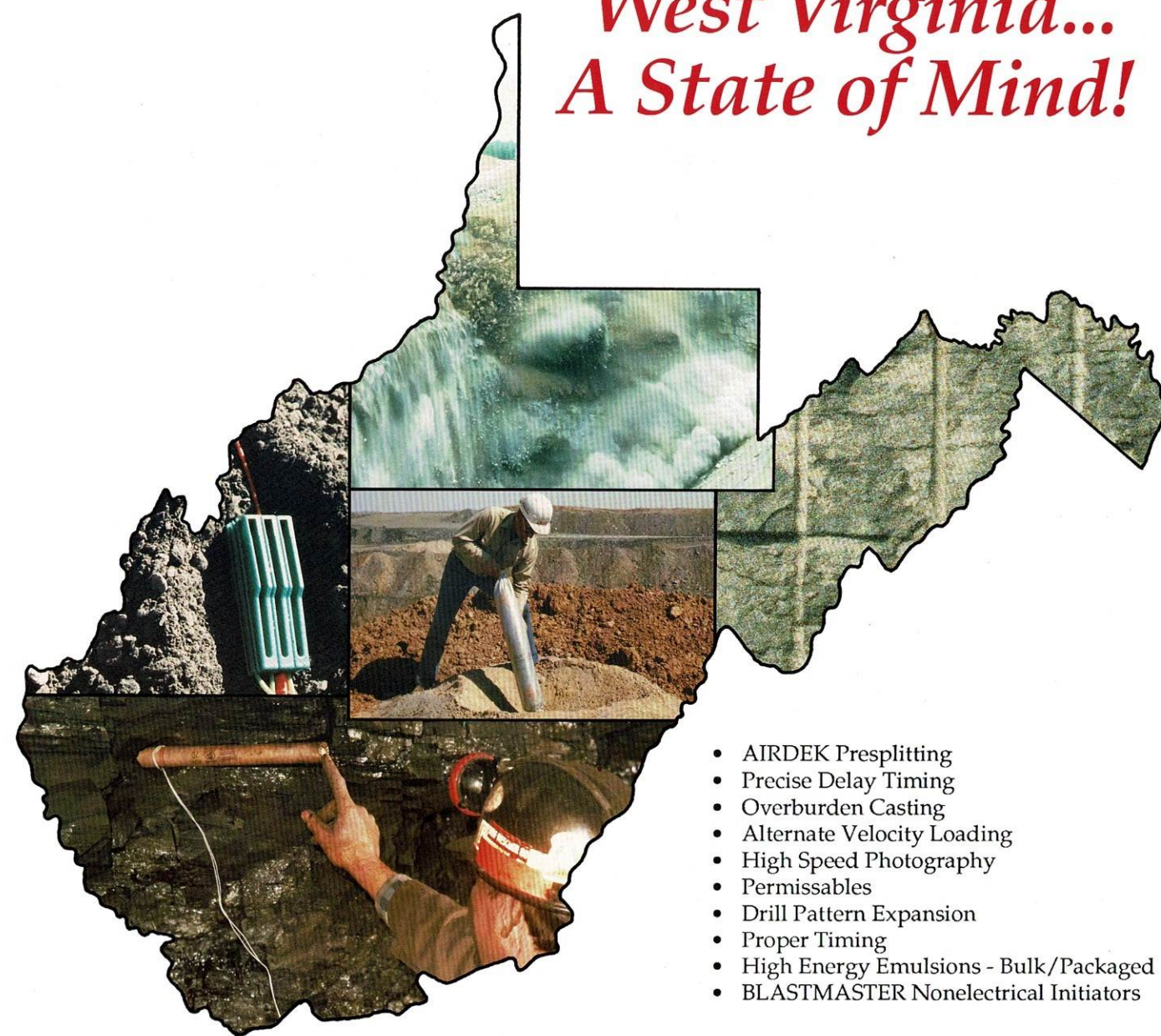
He entered the coal business with the establishment of Grafton Coal Co. in 1942, and over a long career has been noted for a variety of positive accomplishments, including the invention of the coal auger, the advancement of nutritional research and education, and many other philanthropic interests.

Jim Compton's Plaque

For long and dedicated service to the coal industry, to the West Virginia Mining & Reclamation Association, and to the State of West Virginia, Designates C. E. "Jim" Compton, Grafton Coal Company, Bridgeport, West Virginia as an Honorary Member of the Board of Directors.

As a founding and continuous member of WVMRA, a fifteen year member of its Board of Directors, and as a responsible, innovative mine operator and steward of the land, Jim Compton has contributed immeasurably to the success of the organization, and, thereby, to the success of the coal industry, and to the prosperity of the State of West Virginia.

West Virginia... A State of Mind!



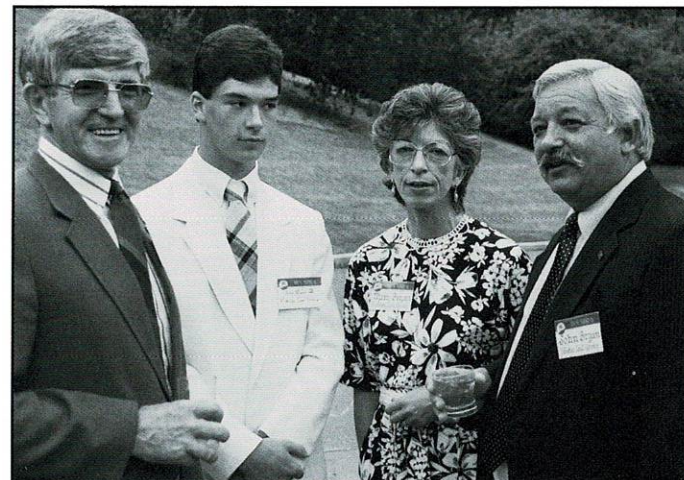
- AIRDEK Presplitting
- Precise Delay Timing
- Overburden Casting
- Alternate Velocity Loading
- High Speed Photography
- Permissibles
- Drill Pattern Expansion
- Proper Timing
- High Energy Emulsions - Bulk/Packaged
- BLASTMASTER Nonelectrical Initiators

West Virginia Explosives... A State-of-the-art Explosives Distributor

Call us for an on-site evaluation of your drilling and blasting program.
Bruce Wood, Vice President • Beckley, West Virginia • (304) 252-8505



ICI A distributor
of ICI explosives products



State Senator J.D. Brackenrich (l) with the Bryan family (l-r) John, III, Mary, and John, Jr.



Terry Dotson (l) with Lawrence Streets.



Bill Anderson (r) with Myrleen and Jack Fairchild.

Scenes from The Greenbrier



(l-r) Gerald Ramsburg, John Sturm, Steve Cvechko, John Skidmore.



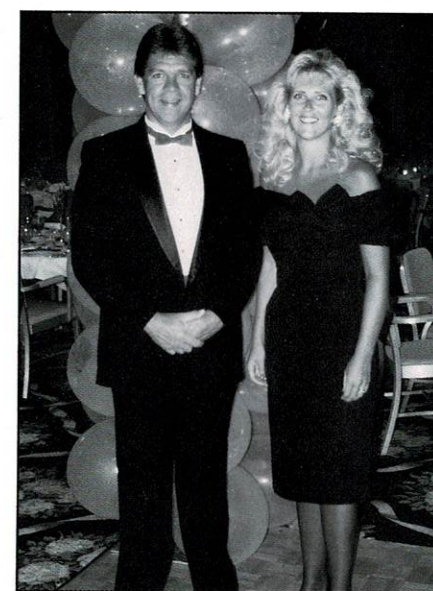
Jack Grimm looks like a winner at the blackjack table --- but he wasn't.



These hardy survivors of Thursday's "Monte Carlo Night" got off to a 7:00 a.m. start in Friday's "Fun Run."



Rock 'n Roll was the order of the evening for the Friday night "Coal Miners' Party" on Kates' Mountain.



Steve and Lynn Cvechko at the Saturday night formal banquet.

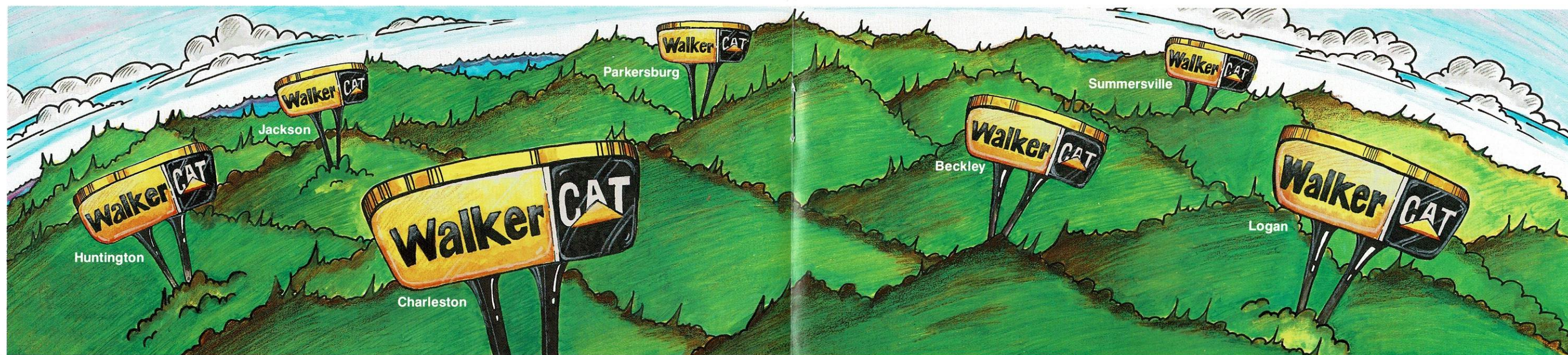


Tennis Chairman Larry Roberts, with a lot of help from Carol Skidmore, finally added his name to the Ingersoll-Rand mixed doubles tennis trophy.



Everybody was a winner in the children's division of the bowling competition.

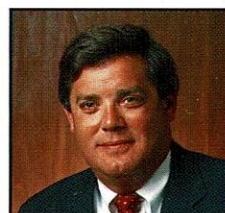
The Homefield Advantage.



At Walker Machinery, we bring the homefield advantage to our customers every day. Better service. And better parts availability.

Better Service. Walker Machinery provides the best service in the business. We have seven locations throughout West Virginia and southeastern Ohio. The only heavy equipment dealer with this many locations. Each location is strategically located so that all of our customers are within 50 miles of a Walker Machinery location. That's important for quick response to a customer's request.

Better Parts Availability. Walker Machinery has 97% parts availability within 24 hours. So most likely, your part is in our \$17 million in-stock inventory of more than 85,000 line items.



Steve Walker
President
Walker Machinery

However, if it's not in stock, we can easily access it for you through our computerized dealer terminal system. This system will access the total Caterpillar parts network throughout the world. Your order will then be on its way to us overnight for next day delivery to your job site.

Better Component Exchange Program. Walker Machinery also offers the largest component exchange program in the region. Our 450 in-stock exchange items assure fast repairs and keep downtime to a minimum.

"We're in the game to win our customers' business by providing better service, better parts availability, and better equipment. That's the Walker difference," says Steve Walker, President, Walker Machinery.

Call any Walker Machinery location and learn more about the homefield advantage.

CHARLESTON	304-949-6400
BECKLEY	304-253-2706
PARKERSBURG	304-424-0200
SUMMERSVILLE	304-872-4303
LOGAN	304-752-0300
HUNTINGTON	304-526-4800
JACKSON, OHIO	614-286-7566



The **Walker** Difference

Associate Welcoming Reception Sponsors

AKERS SUPPLY COMPANY	JACKSON & KELLY
AMHERST INDUSTRIES, INC.	JOHNSON RAILWAY SERVICE, INC.
ANDERSON OF WEST VIRGINIA	JUSTICE SUPPLY COMPANY
APPALACHIAN TIRE PRODUCTS, INC.	KANAWHA STEEL & EQUIPMENT COMPANY
ATLAS POWDER COMPANY	LABOR RELATIONS ASSOCIATES, INC.
AUSTIN POWDER COMPANY	LILLY EXPLOSIVES COMPANY
BAKER EQUIPMENT ENGINEERING COMPANY	LOGAN & KANAWHA COAL COMPANY, INC.
BECKLEY FEED & HARDWARE COMPANY	MACK TRUCKS, INC.
BECKWITH MACHINERY COMPANY	MARATHON LeTOURNEAU COMPANY
BIG SANDY TERMINAL, INC.	MCDONOUGH CAPERTON INSURANCE GROUP
BOWLES, RICE, McDAVID, GRAFF & LOVE	MIDWEST STEEL CORPORATION
BRACKENRICH & ASSOCIATES, INC.	MILLER & MILLER AUCTIONEERS, INC.
BRIDGEPORT TRUCKING COMPANY	MON VALLEY ROSEDALE
CARTER MACHINERY COMPANY, INC.	MT. STATE BIT SERVICE, INC.
CECIL I. WALKER MACHINERY COMPANY	OHIO SEED COMPANY
CHAMBERLAINE & FLOWERS, INC.	PETROLEUM PRODUCTS, INC.
CHARLES RYAN ASSOCIATES, INC.	POCAHONTAS LAND CORPORATION
COAL FIELD MACHINERY, INC.	RMI, LTD.
COUNTRY BOY SEED, INC.	RAG PICKERS, INC.
CROWN HILL EQUIPMENT, INC.	REICHDRILL, INC.
CUMMINS CUMBERLAND, INC.	REPUBLIC INDUSTRIES
DOMINION BANK	RISH EQUIPMENT COMPANY
EIMCO COAL MACHINERY INCORPORATED	ROBINSON & McELWEE
THE ENSIGN BICKFORD COMPANY	RUDD EQUIPMENT COMPANY
EXPLOSIVES, INC.	SII SMITH INTERNATIONAL
FAIRCHILD INTERNATIONAL	SKELLY AND LOY
FINANCIAL PROFESSIONALS CORPORATION	STAGG ENGINEERING SERVICES, INC.
FLAT TOP INSURANCE AGENCY	STATE EQUIPMENT, INC.
GAI CONSULTANTS, INC.	STURM ENVIRONMENTAL SERVICES, INC.
GENERAL TRUCK SALES CORPORATION	TAMROCK DRILTECH
GILBERT DISTRIBUTING COMPANY, INC.	TOOTHMAN RICE & CO.
GOULD ENERGY	TROJAN CORPORATION
GRESS EQUIPMENT COMPANY	UNION NATIONAL BANK OF WEST VIRGINIA
HATFIELD TERMINALS, INC.	UNITED NATIONAL BANK
HEAVY MACHINES, INC.	WEST VIRGINIA COALS, INC.
INGERSOLL RAND COMPANY	WEST VIRGINIA EXPLOSIVES COMPANY, INC.
IRECO INC.	WORLDWIDE EQUIPMENT, INC.

Prize Contributors

Much of the success of the activities portion of the Annual Meeting is due to the generosity of the companies and individuals who donate prizes for the competition. Because of them, everyone who participates has a chance to come away a winner. Thanks so much to those who contributed, and to the chairmen who gave their time and effort.

Bowling Tournament - Bruce Sparks, Anker Energy

Anker Energy Corp. (Bruce Sparks) - \$200
Beckwith Machinery Co. (Dave Trueman) - \$100
Fairchild International (Jack Fairchild) - \$25
Fairfax Fuel, Inc. (Dave Maynard) - \$100
Flat Top Insurance Agency (Jack Lee) - \$50
Geupel Construction Co., Inc. (Paul Hutchins) - \$100
Lilly Explosives Co. (Tim Warden) - Children's Prizes
Pittsburgh National Bank (Dale Stein) - \$50

Children's Putting - Bob Gibson, Lilly Explosives

Lilly Explosives Co. (Bob Gibson) - Yoyos

Fishing Tournament - Bruce Wood, WV Explosives

Allegheny Mining Corp. (Lawrence Streets) - Mirror
Penn Line Service (Larry Roberts) - Ice Chest & Thermos
West Virginia Explosives Co., Inc. (Bruce Wood) - Fishing
Rods & Reels & \$25

Fun Run - John Sturm, Sturm Environmental Services

Atlas Powder Co. (Waller Caldwell) - Running Shoes
Penn Line Service (Larry Roberts) - Athletic Tote
Sturm Environmental Services, Inc. (John Sturm) - \$50

Golf Tournaments - John & Betty Rader, Union Carbide

Anderson of WV (Tom Meehan) - \$10,000 Hole In One
Beckwith Machinery Co. (Dave Huffman) - \$100
Cecil I. Walker Machinery Co. (John Williamson) - \$100
Crown Hill Equipment, Inc. (Chris Supcoe) - \$100
Cummins Cumberland, Inc. (Ed Surgeon) - \$50
Flat Top Insurance Agency (Ardie McMillion) - \$100
Heavy Machines, Inc. (Dan Blizzard) - \$100
Ingersoll-Rand Co. (Jim Green) - Tees
Lilly Explosives Co. (Bob Gibson) - \$100
Marathon LeTourneau Co. (Earl Beckman) - \$200
McDonough Caperton Insurance (Charlie Morton) - \$100
Mt. State Bit Service (Paul Laskody) - Blaster's Lamp
Rish Equipment Co. (Dan Pochick) - \$100
Rudd Equipment Co. (Roger Fitch) - \$100
Tamrock Driltech (Jim Chrvia) - \$150
Union Carbide (John Rader) - Trophy & Necklace

Ladies' Program

Evelyn Briscoe - Hand Painted Beach Coverup and Hat
Lillys' Crown Jewelers - Angel Pins

Monte Carlo Party

Allegheny Mining Corp. (Lawrence Streets) - Mirror
Anker Energy Corp. (Bruce Sparks) - \$100
Austin Powder Co. (Herm DeProspero) - Blaster's Clock
Crown Hill Equipment, Inc. (Chris Supcoe) - \$50
Cummins Cumberland, Inc. (Ed Surgeon) - \$100
Dryden Oil Co. (Gary Sweeney) - Ice Bucket
Dominion Bank (Stuart Swanson) - \$100
Flat Top Insurance Agency (Lee Jordan) - \$100
Gould Energy (Jim Ashby) - \$50
Ingersoll-Rand Company (Jim Green) - Compressor
Ireco Inc. (Don Adkins) - \$100
Penn Line Service, Inc. (Larry Roberts) - \$25
Republic Industries (John Krebs) - Gold Eagle Coin
Rudd Equipment Co. (Roger Fitch) - \$50
Worldwide Equipment Co. (Terry Dotson) - \$50

Name Tag Drawing

Dominion Bank (Stuart Swanson) - 20" Sony TV
Ingersoll-Rand Co. (Jim Green) - \$100
Explosives, Inc. (Bernard Folio) - Wine

New Chairman's Breakfast Drawing

Austin Powder Co. (Herm DeProspero) - Blaster's Clock
Ingersoll-Rand Co. (Jim Green) - \$100
Worldwide Equipment, Inc. (Terry Dotson) - \$50

Tennis Tournament - Larry & Jenny Roberts, Penn Line Service

Dryden Oil Co. (Gary Sweeney) - Ice Bucket
Fairchild International (Jack Fairchild) - \$25
Gould Energy (Jim Ashby) - \$50
Green Acres Contracting Co. (Ron Trabucco) - \$100
Ingersoll-Rand Co. (Jim Green) - \$100 & Trophy
Ireco Inc. (Don Adkins) - \$100
Penn Line Service, Inc. (Larry Roberts) - \$105
Skelly and Loy (John Gunter) - \$50
Sturm Environmental Services, Inc. (John Sturm) - \$50

Trap Tournament - Joe Ison, Coal Field Machinery & Martin Dotson, Anderson of West Virginia

Anderson of West Virginia (Martin Dotson) - Knife
Coal Field Machinery, Inc. (Joe Ison) - Vest
Nell Jean Enterprises, Inc. (Warren Hylton) - Vest
Penn Line Service, Inc. (Larry Roberts) - Ice Chest
Robinson & McElwee (Joe Price) - \$200



The **LARGEST** Truck ever delivered in West Virginia 205 Ton DRESSER Haulpak 685E

DRESSER®

Crawler Dozers
Low Ground Pressure Crawler Dozers

Crawler Loaders
Wheel Dozers

Wheel Loaders
Motor Graders
Soil & Asphalt Compactors
Off Highway Dump Trucks

Anderson OF WEST VIRGINIA

For more information on any quality Dresser machine, call the Anderson office nearest you.

CHARLESTON AREA
Route 119 South
Alum Creek, WV 25003
756-2800

BECKLEY AREA
210 George St.
Beckley, WV 25801
255-6699

CLARKSBURG AREA
Lewis County Ind. Park
Jane Lew, WV 26378
884-7821



The 'Bang Gang' of Lilly Explosives took top honors in the 1990 Associate Division Company Pride competition.

Company Pride Lilly, Starvaggi Take Top Honors

Over 400 members and guests attended the Coal Miners' Party on Kate's Mountain during the Association's 24th Annual Meeting. Threatening skies through the day almost forced the party inside, but at the last minute, the decision was made to "go for it," and the weather cooperated as scattered thundershowers skirted around Kate's Mountain long enough for the festivities to proceed as scheduled.

Traditionally, a highlight of the evening is the "Company Pride" competition, in which employee groups come decked out in official company attire. The winner is the group which best combines numbers and thoroughness.

The winner in the General Division was Starvaggi Industries, Don Donell and company, who always come decked

out, but posted some bigger numbers this year. In the Associate Division, President Ben Greene announced a "dead heat" between defending champion Austin Powder Co., and Lilly Explosives.

Lilly, the "Bang Gang," in shocking pink shirts and special table balloons, was declared the 1990 winner, settling up a final confrontation between the business rivals at "Kates' Mountain - 1991."

Special awards went to Worldwide Equipment, who showed up eight strong and dressed literally from head to toe in company colors and logos, and Walker Machinery, recognized for its long and continuous effort in the spirit of the competition.

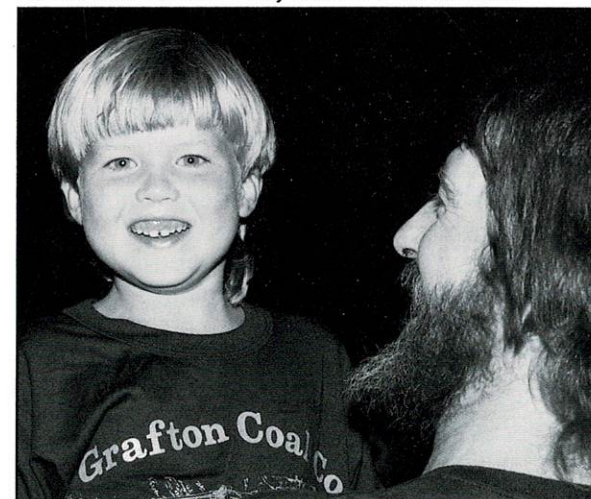


Austin Powder made a valiant effort to defend its Company Pride title, and no doubt will be back in force next year for the "rubber match" with Lilly Explosives.



Ingersoll-Rand people came to Kate's Mountain from as far away as Texas.

Jimmy Compton of Grafton Coal got his second wind as the Coal Miners' Party started to wind down.



Where the heck is Ponca City ?



Just ask Lisa and Bill Shropshire of Sii Smith International.

Company Pride



(l-r) Paul Mongell, Jenny Roberts, Vicky Mongell, and Larry Roberts all take pride in Penn Line's 50th Anniversary this year.



Worldwide Equipment won a special award for its "head-to-toe" Company Pride look.



Walker Machinery was recognized for its consistent participation in the Company Pride competition.

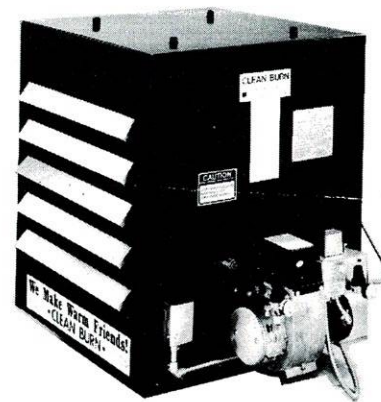
GET RID OF WASTE OIL PROFITABLY TURN IT INTO FREE HEAT WITH A Clean Burn™

WASTE OIL FURNACE

Your CLEAN BURN Furnace will destroy that dirty oil efficiently, without smoke or odor . . . and heat your shop to boot.

We think our furnaces are the best on the market.

Just call us for a free demonstration and we'll be glad to tell you why.



Hotels Equipment
Company

CLEANING SYSTEMS & CHEMICALS

WE MAKE WARM FRIENDS

CHARLESTON, WV 744-3493
CLARKSBURG, WV 623-6335

Chamberlaine & Flowers^{INC.}



INSURANCE
TRAVEL

- 128 South Second Street
Clarksburg, West Virginia 26301
(304) 623-3721
- 114 High Street
Morgantown, West Virginia 26505
(304) 292-8454
- 18 West Main Street
Buckhannon, West Virginia 26201
(304) 472-2402



"Insurance and Travel"



Acid Mine Drainage Treatment Systems: Chemicals and Costs

by Jeff Skousen, Ken Politan, Tiff Hilton, & Al Meek

Introduction

Since the early 1970's, West Virginia regulations have advocated mining and reclamation techniques to prevent acid from being formed during surface coal mining operations. Overburden analytical methods are used to identify rock layers which are acid-toxic, potentially acid-producing neutral, or alkaline-producing. Through analyses and interpretation, overburden handling and placement plans may be developed. Each operator must carefully develop the mining plan based on the site's overburden characteristics, and must see that the overburden handling plan is implemented.

Even with the application of mining and reclamation practices, amendments, and other technologies, acid mine drainage (AMD) is still a persistent problem. Different techniques have been applied in laboratories which show excellent control, but when conducted or installed in the field on mine sites, the technology or its application show limited success. As a result, AMD is still occurring and the coal industry pays a high price for treatment on many active jobs. Treatment of AMD includes neutralization of the acidity and precipitation of metal ions.

Preliminary Evaluations for Selection of an AMD Treatment System

Before a specific chemical reagent or treatment technology is selected, the effluent limitations should be determined. Effluent limitations are performance standards in discharge water that the operator must achieve. The effluent limitations are established in the NPDES/Article 5A Permit.

At a minimum, an operator must achieve EPA's "technology based" effluent limitations established in (Federal Register) 40 CFR, Part 434. These requirements include effluent limitations for pH, iron, manganese, suspended solids, and settleable solids. However, in situations where EPA's technology based effluent limitations will violate the water quality standards, a more stringent effluent limitation will be established in the NPDES permit. These stringent limitations are known as "water quality based" effluent limitations.

A water quality standard consists of a water or stream use and numerical criteria to protect that use. For example, a stream may have a cold water fishery (trout) use and an

iron criteria of 0.5 mg/l to protect and maintain that use.

A water quality based effluent limitation will be based on the stream's use and quality, and the discharge's quality and quantity. Also, a water quality based effluent limitation may be assigned when the receiving stream does not have sufficient dilution capacity (i.e., the discharge quantity is equal to or greater than the receiving stream flow). Therefore, determination of the receiving stream's use and flow rate (seasonal variation included) is of paramount importance.

Depending on the stream use, other parameters and/or effluent limitations may also be assigned in the NPDES permit which will require monitoring and meeting a performance standard. For instance, the location of the treatment facility may dictate the type of effluent limitation that may be established in the permit. In most cases, the location of the treatment facility cannot be changed, because it must be located near the source or collection pond. However, if the location can be varied, the treatment facility should be located so it discharges into a larger flow stream, and/or into a less sensitive stream. These factors will determine the effluent limitations assigned in the NPDES permit.

Once the effluent limitations (either "technology based" or "water quality based") are established, a treatment facility can be designed to treat the water to achieve these limits. These effluent limitations will help determine the amount of aeration and flocculation, the pH needed for metal precipitation, the amount of chemical needed, or any other treatment technology required. Designing a treatment facility without knowing the effluent limitations is a waste of time and money. The regional NPDES permit writer may provide assistance with a preliminary determination of the effluent limitations.

Chemicals

Four chemicals are typically used in treating AMD: calcium carbonate (limestone), calcium hydroxide (hydrated lime), sodium carbonate (soda ash or briquettes), and sodium hydroxide (caustic soda). Each chemical has advantages and disadvantages which make it more appropriate for a specific condition. Ammonia will also be discussed.

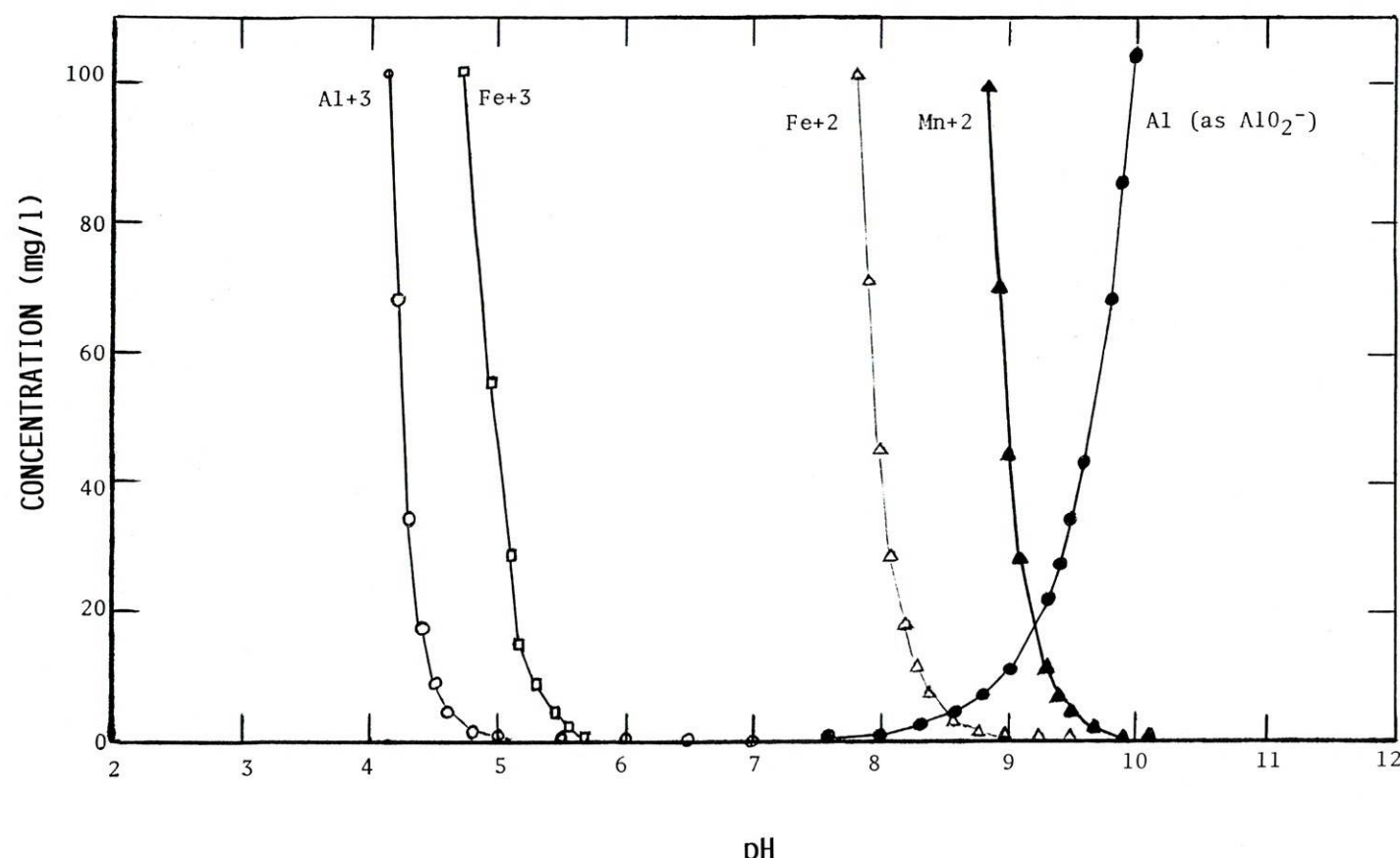


Figure 1. Theoretical solubilities of selected ions. (Taken from Pennsylvania Department of Environmental Resources, "Engineering Manual for Coal Mining Operations." 1990)

The four primary characteristics important for selection of an appropriate chemical are the rate and degree of pH increase, its solubility in water (which influences mechanization), handling, and cost. The four chemicals can be discussed in relation to calcium versus sodium, and carbonate versus hydroxide.

Calcium vs Sodium

The degree or rate of pH increase is generally slower with a calcium product, simply because the solubility of calcium products is lower than sodium. Effectiveness and efficiency of AMD treatment with calcium products and soda ash are greatly improved by mixing/aeration. These three chemicals are also relatively easy to handle and require few safety precautions. Caustic, on the other hand, must be handled with care. The calcium compounds are less expensive than sodium compounds.

Carbonate vs Hydroxide

Depending on the acidity level of the water, carbonate materials have been shown to raise pH to 12.0. However, their effectiveness in neutralizing acidity and precipitating metals is limited and may not be long lasting. If the water contains high amounts of acidity, carbonate materials will not raise the pH above 9.0. Hydroxide materials can easily raise the pH to 12 or higher, so overapplication of a hydroxide material can produce a very undesirable situ-

ation. Carbonate materials are easily handled because the products are usually large, briquette-size or gravel-size material. Hydroxide materials are mostly powder, flakes, or liquid.

The types and amounts of metals in the water (which contribute to water acidity) have a strong influence on the selection of a chemical, and the AMD treatment system. Ferric iron (oxidized, +3 form) converts to a solid yellowish-orange precipitate (ferric hydroxide or yellow boy) at a pH of 5.5 or greater (Figure 1). Ferrous iron (reduced, +2 form) converts to a solid bluish-green ferrous hydroxide at a pH of 8.5 or greater. Soluble manganese changes to insoluble manganese hydroxide at a pH of 9.5 or greater. Aluminum precipitates in water at a pH of 5.5, but resolubilizes at a pH of 8.5 or greater. Therefore, depending on the composition of metals and their concentrations in AMD, selection of the most appropriate chemical can be determined.

Limestone (calcium carbonate) has been used for decades to raise pH and precipitate metals in AMD. It is the cheapest, safest, and easiest to handle of all the chemicals. Unfortunately, its application shows limited success since it has low solubility and the limestone becomes coated very quickly if metals are dissolved in the water. For example, if the iron concentration is above 5 mg/l, the limestone will be rendered ineffective in a short time period because the limestone particles become armored. Limestone is not used for AMD with acidity values above 50 mg/l.

Hydrated lime (calcium hydroxide) is a very common chemical used for neutralizing AMD. It is particularly useful and cost effective in large flow, high acidity situations, where a lime treatment plant with an aerator are constructed to help dispense and mix the chemical with the water. The powdery hydrated lime is hydrophobic, so extensive mixing is required to make hydrated lime soluble in water. The length of time that the system will be in operation is also a critical factor in determining the annual cost and total value of a lime treatment system due to the large initial capital expenditure. Hydrated lime has limited effectiveness in some places where a very high pH is required to remove metals such as manganese.

Caustic soda (sodium hydroxide) is also a commonly used chemical which is often applied in more remote (electricity is unavailable), low flow situations. Caustic raises the pH of the water very quickly, is extremely soluble, and is used where manganese is a problem. The system can be gravity fed, simply by dripping the liquid into AMD and the caustic, because of its solubility, will spread throughout the water. Caustic should be surface applied into ponded water because the chemical moves downward into the water. The major drawbacks of the use of liquid caustic for AMD treatment are its high cost and dangers in handling. During winter months, the liquid caustic can freeze, so a small amount of antifreeze must be added to the solution. Solid caustic, which may be delivered in a 70 pound drum or in bags, has been used with good success. Metering the flow of water into the drum is possible to regulate the rate at which the caustic dissolves. Solid caustic has been shown to be cheaper and easier to handle than liquid caustic.

Soda ash (sodium carbonate) is generally only used in small flow cases with low amounts of iron. Selection of soda ash for treating AMD is usually based on convenience rather than cost effectiveness. The dispensing system for briquettes can be as simple as employing a box or barrel with water inlets and outflows. As the water contacts the briquettes, a small amount of the soda ash dissolves. Gravity keeps the briquettes feeding into the inlet for constant water treatment. If iron is higher than 10 or 20 mg/l, a mixing system will improve efficiency and treatment. Briquettes are easily handled, but are expensive. Many different formulations of "briquettes" are available, so it is important to carefully select briquettes that are "pure" soda ash or of high quality. The size of the briquette is a clue to its quality; i.e., the smaller the size, the higher the quality. Large briquettes often contain "binders" which are mainly pressed hydrated lime.

Anhydrous ammonia is being used in some areas to neutralize acidity and to precipitate metals in AMD. Ammonia is usually injected into ponds or into inlet water as a vapor and, due to its high solubility, reacts very rapidly and can raise the pH to 9.0 or higher. Ammonia consumes acid (H+) and also generates hydroxyl ions (OH-) which can react with metals for precipitation. It should be injected near the

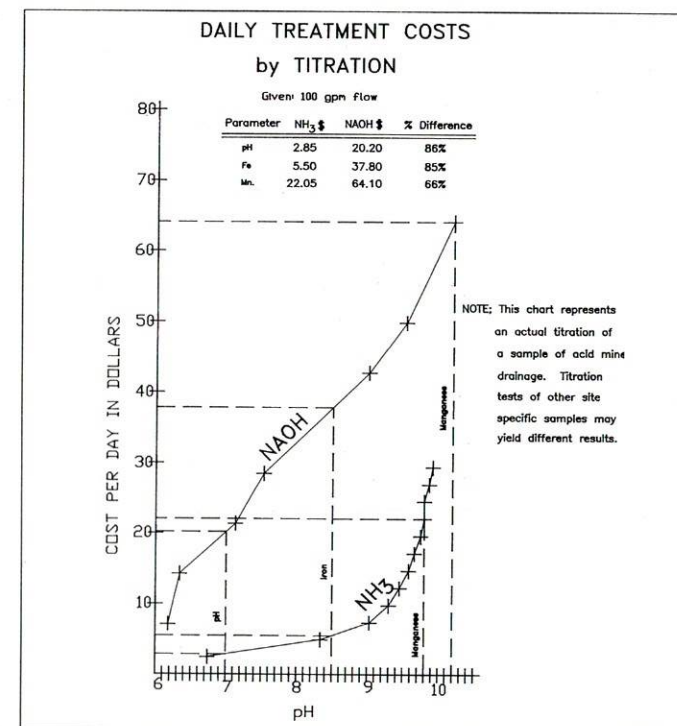


Figure 2. Daily treatment costs with ammonia and liquid caustic. Average flow at this site is 100 gpm.

bottom of the pond or water inlet because ammonia is lighter than water and rises to the surface. Ammonia is effective for manganese removal, which occurs around a pH of 9.5. The most promising aspect of using ammonia for AMD treatment is its cost when compared with caustic soda. A cost reduction figure of 50 to 70% is usually realized when ammonia is substituted for caustic (Figure 2).

Major disadvantages of using ammonia are (1) the hazards associated with handling the chemical and (2) uncertainty concerning some theoretical biological reactions. Specialized training and experience are important for the safe dispensing of this chemical. Companies using ammonia must also conduct additional analyses of their discharge water as it is released into the stream, and must also monitor downstream to assess biological conditions. The extra analyses include temperature, total ammonia-N, and total hot acidity. Operators must be careful to inject the appropriate amount of ammonia or to install a pH-driven monitoring system, because overapplication of ammonia may lead to problems. Figures 3 and 4 show the pH elevation associated with added increments of sodium hydroxide and ammonia. A nearly linear relationship is shown for caustic, while ammonia shows a logarithmic curve. Only a small pH change occurs with the addition of ammonia once a pH of 9.2 is reached. Caution should be exercised once a pH of 9.2 is attained with ammonia because pH elevation beyond 9.2 requires the addition of large amounts of ammonia.

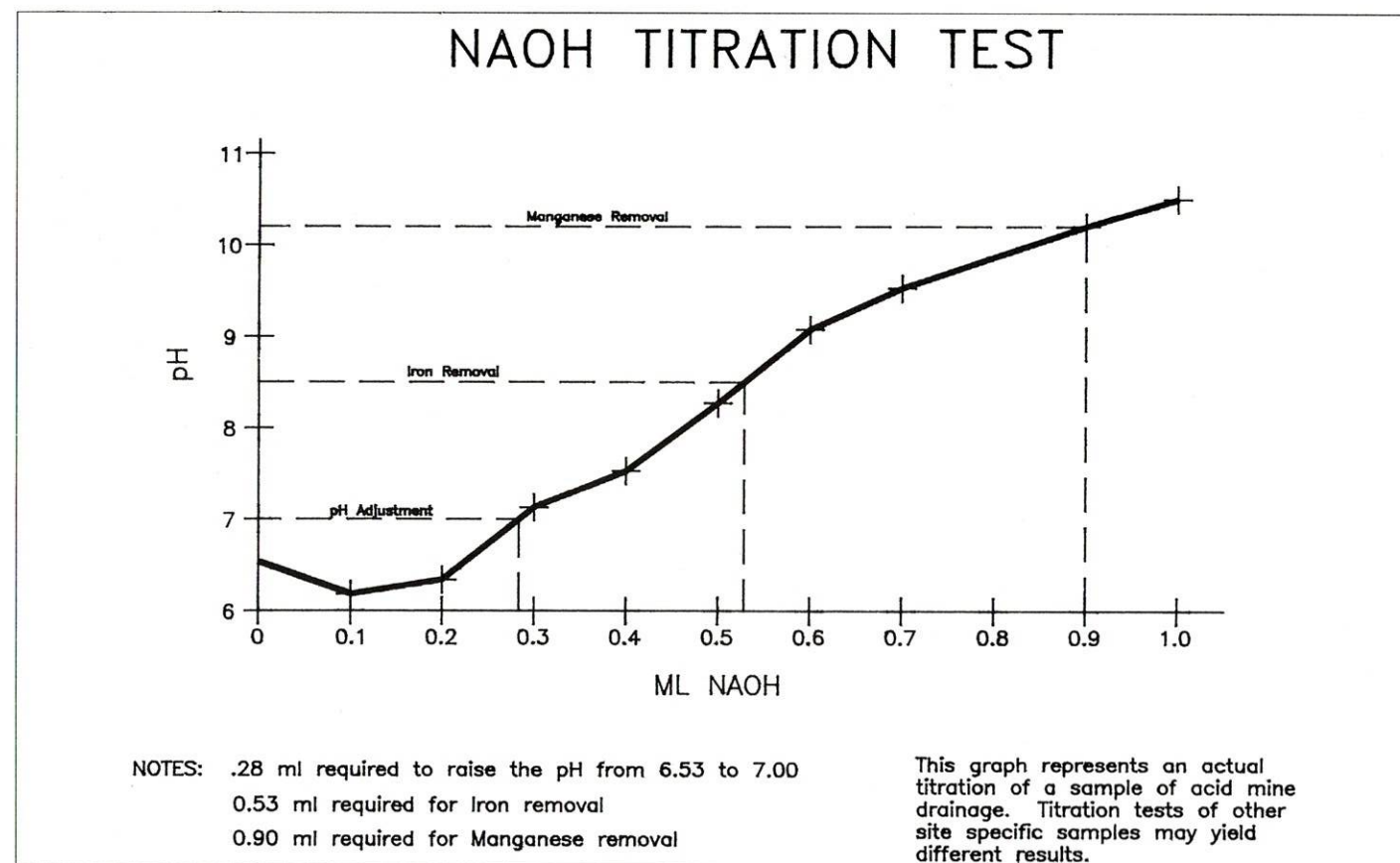


Figure 3. Elevation of pH with added increment of caustic.

Flocculants and Oxidants

Other chemicals used sparingly in AMD treatment include flocculants/coagulants and oxidants. These materials are usually limited to special areas where unique metal compositions require a unique treatment system, or where aeration or residence time in the pond is insufficient for metal precipitation. Flocculants and coagulants are used to increase particle settling efficiency. Coagulants reduce the net electrical repulsive forces at particle surfaces, thereby promoting consolidation. Flocculation aggregates particles by bridging the space between particles with chemicals. Types of flocculants/coagulants include metal salts (aluminum sulfate, ferrous sulfate, and ferric chloride), metal hydroxides (aluminum hydroxide), calcium sulfate, calcium chloride, and synthetic polymers (floc logs).

In special cases, oxidizing chemicals may be used when natural aeration through physical disturbance (aerators or rock channels) is not adequate or rapid enough. Chemicals which are active oxidants include hydrogen peroxide, potassium permanganate, sodium hypochlorite, calcium hypochlorite, and chlorine. The flocculants and oxidants work well, but are expensive and usually can be used only for short time periods.

Residence Time in Ponds and Sludge Generation

The residence time of treated water in a pond must be sufficient to allow precipitation of metal hydroxides. In general, as pH of water and its degree of aeration are increased after treatment, efficiency of the settling process is also increased. Dissolved solids treated with sodium compounds often require longer residence time in ponds for metal hydroxide precipitation. Sodium compounds are commonly used as clay dispersants, and therefore tend to keep solids in suspension. Calcium products, on the other hand, cause faster settling rates and a heavier metal sludge in the pond. Depending on the specific metals and their amounts in the water, co-precipitation of manganese and aluminum may occur as iron is precipitated. With all chemicals currently used for AMD treatment, cleanout of the ponds is necessary to maintain the efficiency of the settling process.

Another consideration in selecting the AMD treatment system is sludge generation and disposal. Any AMD sludge generated must be disposed of properly. In the design of any treatment facility, the amount of sludge that will be generated should be determined, and the length of

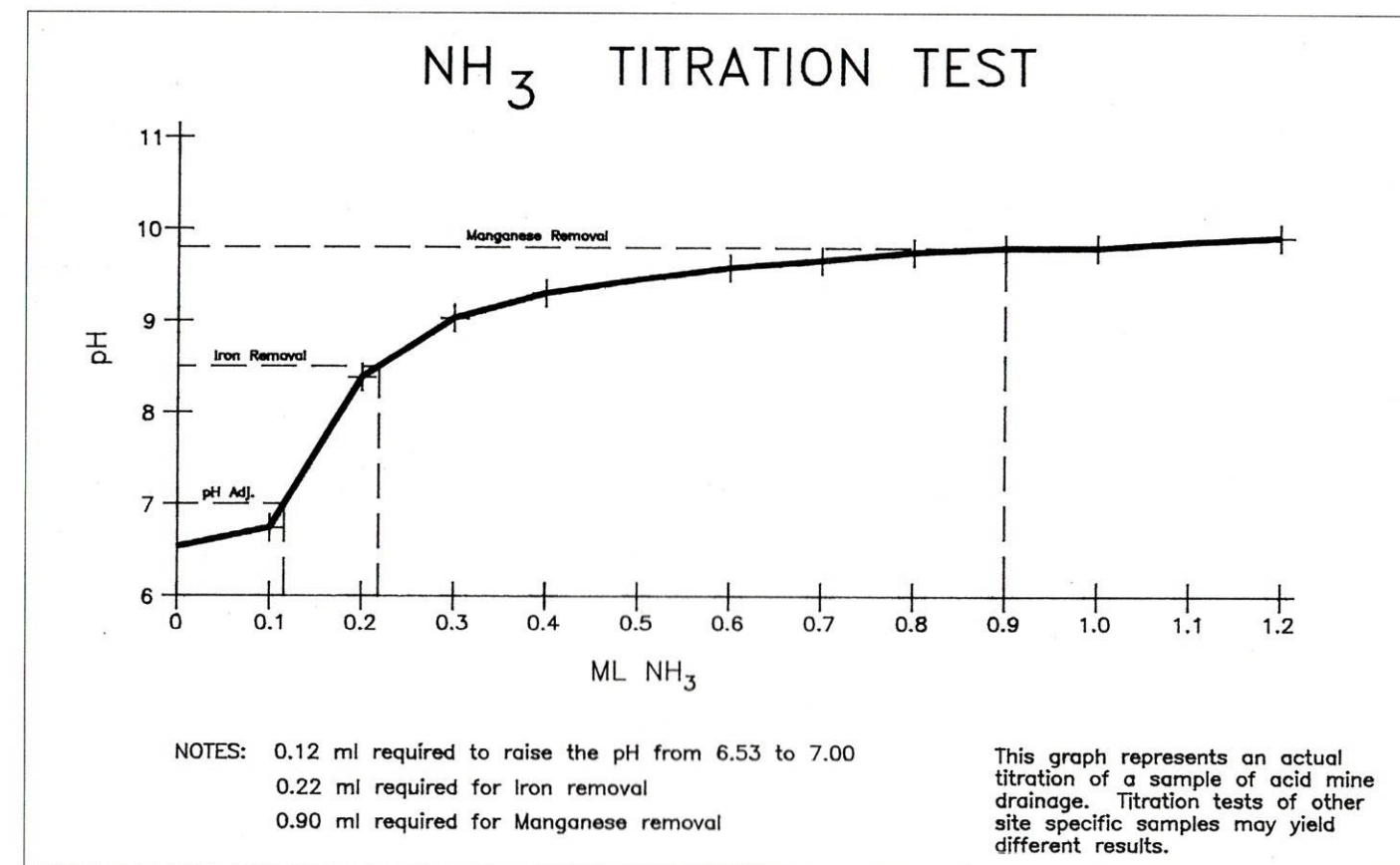


Figure 4. Elevation of pH with added increment of ammonia.

time that will pass before cleanout of the ponds will be necessary should be estimated. The use of different chemicals results in different sludge properties and differences in metal stabilities in the sludge.

When all the factors have been determined and evaluated, then the type of treatment facility, the chemical or combination of chemicals, and the size of the settling ponds can be considered. Cost analysis can be done to find the most cost effective water treatment system that will maintain compliance with the NPDES permit.

Examples of Treatment Costs

In developing the costs for these treatment systems, many assumptions were made. However, these assumptions are commonly exercised when making cost comparisons among different chemicals and different AMD treatment systems. Tables 1 through 4 represent a cost analysis of five chemical treatment systems for four time horizons and four water quality conditions. The results do not contain formulas showing how the totals were calculated, so a brief description of the procedure follows.

Annual chemical costs for each system in each time horizon were calculated using acid neutralization formulas

(Skousen 1988, U.S. EPA 1983), current 1990 chemical prices, and specified water flows and acidities. Calculation of annual cost and total system cost (or net present value, NPV) for each chemical required estimates of system installation costs, annual repair costs, salvage value, time horizon, and interest rate. The total system cost (NPV) was calculated by taking the present value of the system (including installation cost spread over the time horizon, annual repair cost, annual reagent cost, and salvage value), and then summing across the time horizon. The annual cost was obtained by converting (using an amortization formula) the total system cost (NPV) to an equivalent annual cost over the life of the system.

The parameters used in the analysis were entered onto a spreadsheet and any parameter may be varied. Sensitivity of costs through variations of flow, acidity, and duration are demonstrated.

Acknowledgement

The authors thank Tim Phipps, Jerry Fletcher, and Bill Fiske, Agricultural Economics, West Virginia University, for preparing the spreadsheet and providing the values in Tables 1-4.

References

- Evangelou, V. P. 1984. "Controlling Iron and Manganese in Sediment Ponds," *Reclamation News and Views*, Vol. 2 No. 1, February. University of Kentucky, Lexington, KY.
- Evangelou, V. P., and R. C. Warner. 1983. "How Neutralizing Agents Affect Water Quality," *Reclamation News and Views*, Vol. 1 No. 8, May. University of Kentucky, Lexington, KY.
- Kalb, G. W. 1980. "Treatment of Acidic Mine Drainage," *Proceedings*, West Virginia Surface Mine Drainage Task Force, March 14, 1980, Bridgeport, WV.
- Skousen, J. G. 1988. "Chemicals for Treating Acid Mine Drainage," *Green Lands*, Vol. 18 No. 3, Fall, pp 36-40.
- Skousen, J. G., J. C. Sencindiver, and R. M. Smith. 1987. "A Review of Procedures for Surface Mining and Reclamation in Areas with Acid Producing Materials," Publication No. EWRC 871, West Virginia University Energy and Water Research Center, Morgantown, WV.
- Smith, M.S., and V. P. Evangelou. 1982. "Improving Water Quality in Sediment Ponds: Consequences of Neutralizing Acidity with Ammonia," *Reclamation News and Views*, Vol. 1 No. 7, October. University of Kentucky, Lexington, KY.
- U.S. Environmental Protection Agency. 1983. "Neutralization of Acid Mine Drainage, Design Manual," USEPA-600/2-83-001, January. Cincinnati, OH.
- Viessman, W. and M. Hammer. 1985. "Water Supply and Pollution Control." Fourth Edition. Harper and Rowe Publishers, New York, NY.

Green Acres

- Seeding & Mulching
- Guard Rail
- Tree Plantings
- Pipe Cleaning

Green Acres Contracting, Inc.

Al Pisula
(412) 887-9517

Jim Chernitsky
(412) 437-3084

TABLE 1. Annual cost and total treatment system cost or net present value (NPV) for five chemicals used for acid mine drainage treatment in 1990 dollars.

Flow: 50 GPM, 3.2 L/sec Acidity: 100 mg/L Iron: 5 mg/L Duration: 3 years Interest Rate: 6%

Chemical	Installation Cost	Annual Repair Cost	Salvage Value	Annual Reagent Cost	Annual Cost	NPV
Limestone	Not applicable with acidity above 50 mg/L					
Soda Ash	4,000	0	500	3,016	4,355	11,641
Ammonia	*15,000	1,000	5,000	1,116	6,157	16,458
Caustic Soda	2,500	0	500	4,289	5,068	13,546
Hydrated Lime	25,000	3,300	10,000	526	10,038	26,832

*Installation cost for ammonia is based on purchasing a tank, rather than leasing. Leasing may be considerably cheaper.

TABLE 2. Annual cost and total treatment system cost or net present value (NPV) for five chemicals used for acid mine drainage treatment in 1990 dollars.

Flow: 100 GPM, 6.4 L/sec Acidity: 250 mg/L Iron: 10 mg/L Duration: 5 years Interest Rate: 6%

Chemical	Installation Cost	Annual Repair Cost	Salvage Value	Annual Reagent Cost	Annual Cost	NPV
Limestone	Not applicable with acidity above 50 mg/L					
Soda Ash	4,000	0	500	15,079	15,940	67,144
Ammonia	*15,000	1,000	4,000	5,580	9,432	39,731
Caustic Soda	2,500	0	750	21,447	22,051	94,784
Hydrated Lime	35,000	3,400	12,500	2,631	12,123	51,067

*See note on Table 1

TABLE 3. Annual cost and total treatment system cost or net present value (NPV) for five chemicals used for acid mine drainage treatment in 1990 dollars.

Flow: 250 GPM, 15.8 L/sec Acidity: 500 mg/L Iron: 100 mg/L Duration: 5 years Interest Rate: 6%

Chemical	Installation Cost	Annual Repair Cost	Salvage Value	Annual Reagent Cost	Annual Cost	NPV
Limestone	Not applicable with acidity above 50 mg/L					
Soda Ash	Not applicable with iron above 10 mg/L					
Ammonia	*15,000	1,000	3,000	27,904	31,932	134,510
Caustic Soda	7,500	0	1,000	107,237	108,840	458,474
Hydrated Lime	50,000	3,500	15,000	13,158	25,867	108,963

*See note on Table 1

TABLE 4. Annual cost and total treatment system cost or net present value (NPV) for five chemicals used for acid mine drainage treatment in 1990 dollars.

Flow 500 GPM, 6.4L/sec Acidity: 1000 mg/L Iron:300 mg/L Duration: 10 years Interest Rate: 6%

Chemical	Installation Cost	Annual Repair Cost	Salvage Value	Annual Reagent Cost	Annual Cost	NPV
Limestone	Not applicable with acidity above 50 mg/L					
Soda Ash	Not applicable with iron above 10 mg/L					
Ammonia	*15,000	1,000	2,500	111,614	114,462	842,454
Caustic Soda	7,500	0	1,000	428,948	429,892	3,164,040
Hydrated Lime	80,000	4,000	20,000	52,634	67,351	495,712

*See note on Table 1

Professional Technical Service

Computer Aided Blast Design
High Speed Photography
Cost Analysis
Blast Casting
On Job Blast Analysis



State-Of-The-Art Products

Latest Emulsion Technology
Gelatins & Dynamites
Detonating Cord
Cast Boosters
Blasting Agents
Non-Electric Initiation
World's Most Accurate Blasting Caps

Explosives of Tomorrow...Today!
IN SOUTHERN AND CENTRAL WEST VIRGINIA CONTACT...



Tom Ables
112 Village Green
Princeton, WV 24740
(304) 425-4512



Ernie Blair
P.O. Box 424
Mt. Hope, WV 25880
Office: (304) 877-2301
Home: (304) 465-0196



Robert Runyon
P.O. Box 98
Chapmanville, WV 25508
Office: (304) 855-4521
Home: (304) 855-9106

Let us add a farming dimension to your seeding needs

Bell Farms Reclamation Service

Specializing in

- Land Reclamation
- Landscape Seeding
- Erosion Control

Robert Gene Bell
Rt. 1 Box 373A
Summersville, WV 26651
Phone (304) 872-3749



**WORLDWIDE
EQUIPMENT**

Corporate Offices
P. O. Box 71
Prestonsburg, KY 41653-0071
(606) 874-2172

Huntington Division
5650 Rt. 60 East
Huntington, WV 25703
(304) 736-3401

Prestonsburg Division
KY 1428 East
Prestonsburg, KY 41653-0071
(606) 874-2172
Hazard.....439-2632
Pikeville.....432-3903
Jackson.....666-4343
Whitesburg.....633-2349

Middlesboro Division
Mack Avenue
Middlesboro, KY 40965
(606) 248-5100

Princeton Division
Inter. 1-77 & U.S. 460
P. O. Box 1433
Princeton, WV 24740
(304) 425-7511

Northern Division
Lewis Co. Industrial Park
P.O. Box 171
Jane Lew, WV 26378
(304) 884-7815

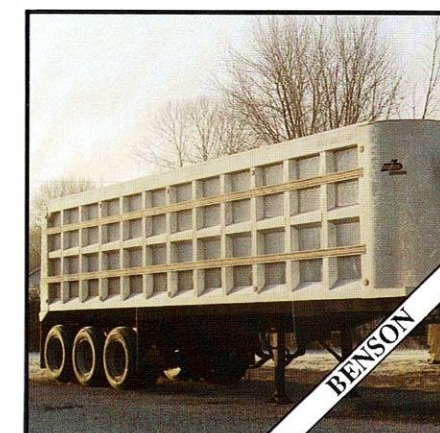
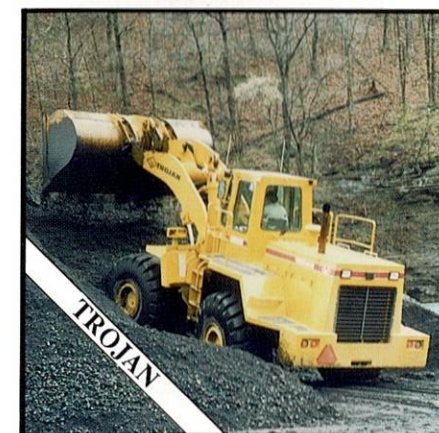
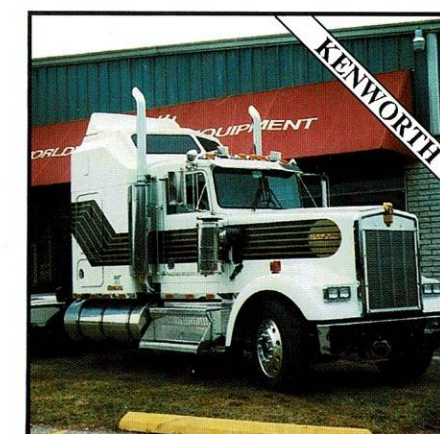
Service Parts, Inc.
U.S. Route 23
Lowmansville, KY 41232
(606) 297-6401

**Appalachian Leasing
Services, Inc.**
P.O. Box 110
Prestonsburg, KY 41653-0110
(606) 874-2175

Hazard Division
Highway 15
P.O. Box 777
Hazard, KY 41701
(606) 439-3022

Lexington Division
945 Nandino Drive
P. O. Box 12073
Lexington, KY 40580-2073
(606) 281-5152

Pac Lease
P.O. Box 12073
945 Nandino Drive
Lexington, KY 40580-2073
(606) 233-3747



Worldwide Brings the World To You!



The Mack Franchise is available in all Worldwide locations except Lexington.

SEEDING, MULCHING, FERTILIZING, TREE PLANTING

J & G Seeding, Inc.

CABIN CREEK, WEST VIRGINIA 25035

GLENN CHAMBERS
JOHN CHAMBERS

PHONE 595-1509



Carter Machinery Company, Inc.

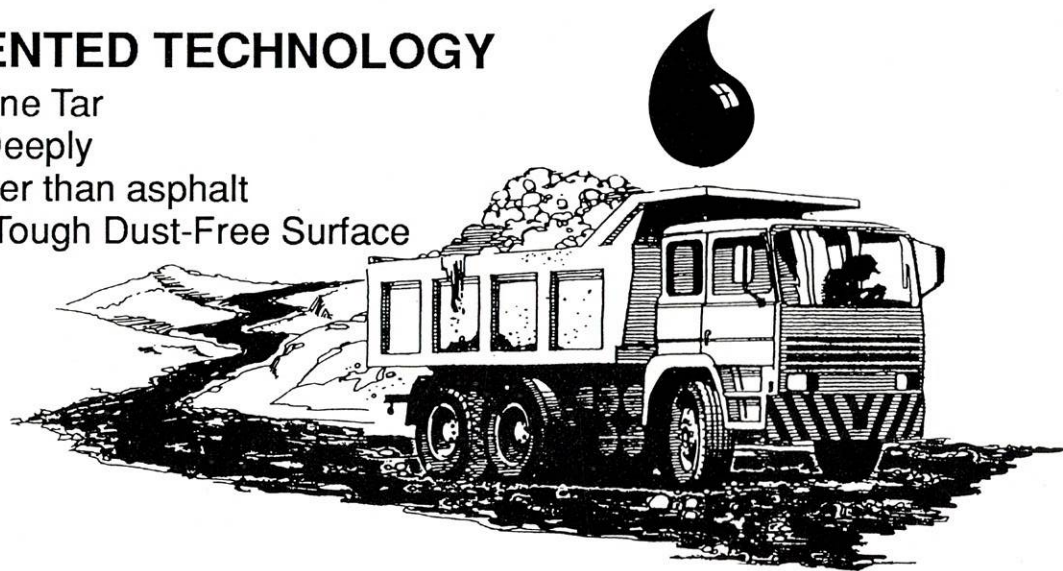
Bluefield 304-325-5411
Lewisburg 304-645-6440
Pineville 304-732-8646

Already Proven and Accepted by Operators and Regulatory Officials Alike

ROAD OIL

NEW PATENTED TECHNOLOGY

- Made with Pine Tar
- Penetrates Deeply
- Binds Stronger than asphalt
- Results in a Tough Dust-Free Surface



EASY TO USE

- Protects the Environment
- Economical
- Just dilute and spray from an ordinary water truck

For more information, or to place an order,
call your Local Distributor



LILLY EXPLOSIVES DELIVERS!!



WE ARE COMMITTED TO
WEST VIRGINIA SURFACE MINING

TIM W. WARDEN
GENERAL MANAGER

BECKLEY, WV
(304) 683-4301



George A. Hall, Ph. D., P.E. • Ira S. Latimer, Jr., Geologist
1624 1/2 Kanawha Boulevard, East
Charleston, West Virginia 25311
(304) 346-7035



"Precision Tank Testing & Environmental Services"

WEST VIRGINIA TANK TESTING, INC.
P.O. BOX 446 • BRIDGEPORT, WV 26330

PAUL S. EMBRY
CONSULTANT/TECHNICIAN

OFF. (304) 623-5255
RES. (304) 622-3892

Gunter Reclamation

in Beckley, West Virginia

Hydroseeding • Tree Planting • Mulching

A subsidiary of Ronald B. Gunter Machinery

1415 Dry Hill Road
Beckley, West Virginia

Office (304) 253-5383
Home (304) 253-2674



TELEPHONE (304) 296-2112

COMPLETE STEEL SERVICE

540 DUNKARD
P.O. BOX 676, MORGANTOWN, WV 26507-0676

NÖBEL'

GROUP BENEFITS

Ronald Berkstresser

Senior Marketing Representative
Nobel Insurance Agency of PA

Box 330
Canonsburg, PA 15317

PA Wats 800-222-2322
National Wats 800-221-8490
Bus 412-746-8700

Coal Calendar

October

- 17-18 **Short Course, "General Blasting Techniques & Explosive Regulations,"** Mining & Mineral Resources Building, University of Kentucky, Lexington, KY, contact Geaunita Caylor, 411 Breckinridge Hall, Lexington, KY 40506, (606) 257-2820.
- 17-19 **Short Course, "Workshop on Microcomputer Applications for Mine Engineering,"** University Park, PA, contact R. L. Franz, Penn State University, 126 Mineral Sciences Building, University Park, PA 16802, (814) 865-7472.
- 19 **Short Course, "Blasting Seismology and Use of Blasting Seismographs,"** Mining & Mineral Resources Building, University of Kentucky, Lexington, KY, contact Geaunita Caylor, 411 Breckinridge Hall, Lexington, KY 40506, (606) 257-2820.
- 26-27 **Fifteenth Annual Mineral Law Seminar,** Radisson Plaza Hotel, Lexington, KY, contact David Short or Joan Bostrom, Mineral Law Center, University of Kentucky College of Law, Room 21, Law Building, Lexington, KY 40506, (606) 257-1161.
- 29-31 **Short Course, "Coal Mine Production Engineering,"** University Park, PA, contact R. L. Franz, Penn State University, 126 Mineral Sciences Building, University Park, PA 16802, (814) 865-7472.
- 31-2 **Fourth Annual Governor's Conference on Worksite Wellness,** Charleston Civic Center, Charleston, contact David Steurer, Wellness Council of West Virginia, (304) 766-4690 or Sarah Kern, McJunkin Corp., P. O. Box 513, Charleston 25322.

November

- 1-3 **West Virginia Coal Association, Fall Meeting,** Lakeview Resort & Conference Center, Morgantown, contact WVCA, 1301 Laidley Tower, Charleston 25301, (304) 342-4153.
- 2-4 **West Virginia Mining & Reclamation Association, Board of Directors' Fall Meeting,** Lakeview Resort & Conference Center, Morgantown, contact Patty Bruce, WVMRA, 1624 Kanawha Blvd. E., Charleston 25311, (304) 346-5318.
- 7-9 **Short Course, "Elements of Coal Preparation,"** University Park, PA, contact R. L. Franz, Penn State University, 126 Mineral Sciences Building, University Park, PA 16802, (814) 865-7472.
- 12-14 **Short Course, "Workshop on Diesel Equipment in Underground Coal Mining,"** University Park, PA, contact R. L. Franz, Penn State University, 126 Mineral Sciences Building, University Park, PA 16802, (814) 865-7472.

January

- 10-11 **18th Annual West Virginia Mining Symposium,** Holiday Inn - Charleston House, Charleston, contact Patty Bruce, WVMRA, 1624 Kanawha Blvd. E., Charleston 25311, (304) 346-5318.

February

- 12-21 **West Virginia Mining & Reclamation Association, Semi-Annual Meeting,** Westin Hotel, Maui, HI, contact Patty Bruce, WVMRA, 1624 Kanawha Blvd. E., Charleston 25311, (304) 346-5318.

Hydroseeding

Call Frank Roberts 755-0408
A Division of Union Boiler Co.



scarlet oaks, inc.

Compliments of

**Peerless Enterprises, Inc.
&
Roy E. Klaproth**

MAGNETITE For Your PREP PLANT

SERVICE
IS THE
HEART
OF OUR
BUSINESS

Akers Supply, Inc.
Matewan, W. Va.
304/426-4422

Akers Magnetite, Inc.
Ceredo, W. Va.
304/453-2222



**Full-Spectrum Engineering
Consulting Services**

- ▲ Civil
- ▲ Mining
- ▲ Environmental
- ▲ Geotechnical
- ▲ Structural
- ▲ Traffic and Transportation

Monroeville, PA ▲ Charleston, WV ▲ Orlando, FL ▲ Raleigh, NC

EXIT COMPETITION

ENTER WA 700-1



The all-new WA 700-1 Wheel Loader from Komatsu and Rish Equipment Company is destined for greatness in the rugged terrain of the Virginias during the decade of the 90s.

Komatsu's state-of-the-art hydraulic technology, innovative microprocessor sensing system and solid state controls assure customer satisfaction on this 11.1 yard capacity loader.

Customer satisfaction is making all of Komatsu's products a leading factor in today's construction equipment market. The new WA 700-1 is sure to be among the elite in its class for customer satisfaction.

You're invited to contact Rish today for details on the WA 700-1. It's a contact worth your time and effort.

KOMATSU
KOMATSU MARKETING DIVISION

Rish
EQUIPMENT COMPANY

Total
TEAM CONCEPT

BECKLEY, WV • 127 Pikeview Drive • 304/255-4111 □ BLUEFIELD, WV • Airport Rd. near U.S. 52 • 304/327-5124
BRIDGEPORT, WV • 515 W. Main St. • 304/842-3511 □ PARKERSBURG, WV • State Rt. 14 • 304/422-8441

ST. ALBANS, WV • Rt. 35 • 304/755-3311

FROSTBURG, MD • 101 Frostburg Ind. Pk. • 301/689-2211 □ COEBURN, VA • Route 72, Wise Mtn. Rd. • 703/395-6901