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Green Lands

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Our Cover — The presentation of the Reclamation Awards is always a highlight on the Association's calendar. This year the top awards went to Hobet Mining, Inc. (upper-cover) and Brooks Run Coal Co. (lower-cover). For details see the story beginning on page 12.



Editor

R. Daniel Miller

Business

Mary Ann Steele

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

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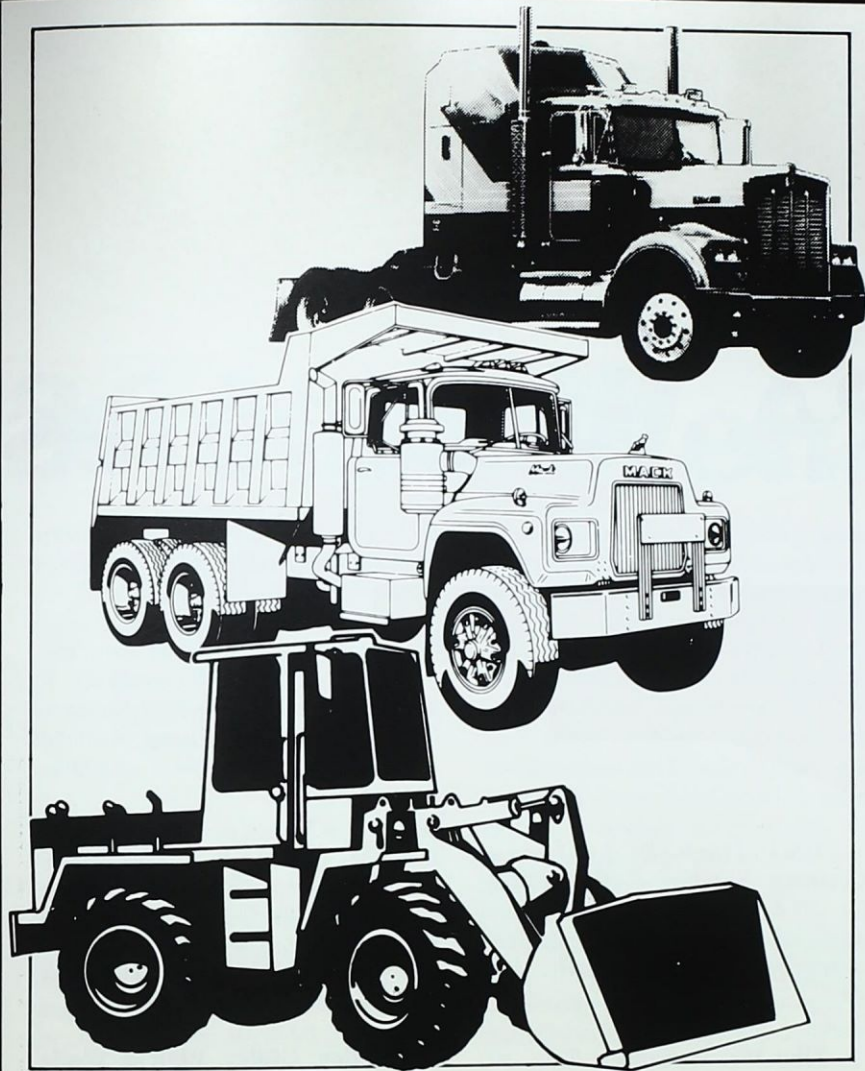
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WVMRA Welcomes

The Association added 36 companies to its roll over the winter months, bringing to 78 the number of new members since the 20th Anniversary Meeting last August.

We extend our heartiest welcome to these companies, along with the hope that their association with WVMRA will be long and fruitful.

Following is a brief sketch of each company, listing the representative to WVMRA, the founding date where applicable, and a summary of the type of business in which the member is engaged.

Appalantic Corp. — Clarksburg, Elizabeth Critch Parsons, founded 1977—underground mining in Lewis County, 30,000 tons per month on long term contract to Harrison Power Station.

Argo Sales Co., Inc. — Wintersville, O., Gary L. Smith, founded 1971 — Mining and industrial parts and repair, including Hensley teeth, Newcastle batteries, Multigab cabs and canopies, Flatguard filters, southeast Ohio, Western Pa., and northern West Va.

Coopers and Lybrand — Pittsburgh, Pa., Eugene W. Kligman, founded 1908 — Auditing, computer analysis, and related services, western Pa. and northern West Va.

Construction & Mining, Inc. — South Charleston, Lawrence P. DeRoo, founded 1972—Site grading

utility installation, and other construction, reclamation, and mining support services throughout West Virginia.

Country Boy Seed Co. — Abingdon, Va., Kyle W. Skeen, founded 1985—sale of seed, mulch, fertilizer, and construction fabric in Virginia, West Va., No. Carolina, Tennessee and Kentucky.

D&J Truck & Equipment Cleaning Service — Catlettsburg, Ky., S. J. Workman — Cleaning and repair of heavy mining equipment, eastern Ky., and southwestern West Va.

Eller Inc. — Beckley, Tracy W. Hylton, II, founded 1986 — surface mining in Nicholas County.

Ensign Bickford Co. — Lexington, Ky., Richard B. Gotcher, founded 1836—Sale of non-electric blasting caps and other blasting supplies in West Va., No. Carolina, Tennessee, Kentucky, and Virginia.

Fitzpatrick Contractors — Kermit, Virgil Fitzpatrick, founded 1975 — Landscaping and related reclamation services, southern West Va.

Golden Enterprises, Inc. — Williamson, Forse Baisden, founded 1985 — Construction services for underground mining in southern West Va.

Guttman Oil Co. — Elkins, Stephen T. Lamm, founded (WV)

1979 — distributor for petroleum products, lubricants, gasoline and diesel fuel in north central West Va.

Interstate Chemical Co., Inc. — West Middlesex, Pa., William P. Cirillo—founded 1968—Distribution of full line of heavy industrial chemicals throughout Pa., N.Y., West Va., Ohio, Ill., and Ind.

J.F. Allen Co. — Clarksburg, John C. Allen, founded 1946—Asphalt paving, highway, dam, and bridge construction, sale of limestone, concrete, concrete block, and reclamation services, in north central West Virginia.

Kelley, Gidley, Blair & Wolfe, Inc. — Charleston, Daniel K. Smith, founded 1955—Consulting engineering services for all types of water and waste management, as well as structural design and environmental evaluation, throughout West Virginia, and the surrounding region; branch offices in Buckhannon, Parkersburg, and Huntington.

Lee Sartin Trucking Co., Inc. — Naugatuck, Riley Lee Sartin, founded 1975 — Coal hauling, gravel hauling and equipment transport in southern West Va.

Mack Trucks, Inc. — Atlanta, Ga. Paul D. Cantrell, founded 1900, coordination of sales, parts and service for Mack Trucks in southeastern U.S.

Nanack Tire & Equipment

36 New Members

Inc. — Pikeville, Ky., Floyd Fields, founded 1985 — Distributor for tires and underground mining equipment in eastern Ky. and southern West Va.

Octagon Associates, Inc. — Kingwood, William E. Kerns, founded 1986 — surface mining in Preston County.

PB&S Chemical Co. — St. Albans, Charles J. Marshall, founded 1947 — Eighteen operating branches in southeast U.S., from Fla. to Pa., full line of chemicals including packaged chlorine, caustic sodas, prep plant chemicals, full water treatment and supply services in West Va., Ky., and southwest Va.

Pioneer Construction — Summersville, J.R. Wardwell, founded 1985, mine construction and general reclamation in West Virginia, Kentucky, Maryland, and Pennsylvania.

Reed Mining Tools, Inc. — Beckley, Clay Walker — Distribution and sale of bits, milled teeth, and related equipment in southern West Va.

REMANCO/Reserves Management Co. — Charleston, Lawrence Thacker, Jr., founded 1986, coal marketing and management services in southern West Virginia.

R.M. Wilson Co., Inc. — Wheeling, David J. Coyne, founded 1966-manufacturers agent for prep

plants, coal crushers, and all other types of mining equipment and supplies, in western Pa., western Maryland, eastern Kentucky, southwest Virginia, Ohio, and throughout West Virginia, with branch office and warehouse in Beckley.

Rob-Lu Oil Co., Inc. — Clarksburg, James I. McDonald, founded 1980 — wholesaler for lubricants, oil, for Pennzoil, Chevron, and others in north central West Va.

Rogers Petroleum Services Inc. — Pikeville, Ky., founded 1935 — Wholesaler/distributor for Chevron oil products in eastern Ky. and southern West Va.

Schaeffer Lubricants — St. Albans, John Vickers—distributor for oil products in central and southern West Va.

Shamblin Stone, Inc. — Institute, Clarence B. Shamblin, sale of limestone, sand, gravel, road salt and roofing gravel in southern West Va.

Stowers Fire Extinguisher Service — Williamson, Dulaney Stowers, founded 1957 — Sale of fire extinguishers and first aid equipment including Kidde, Amerex, and Ansul products in southern West Va., and eastern Ky.

Terraform Engineers, Inc. — Naperville, Ill., Frances S. Kendorski—Consulting engineering, environmental

auditing, and related services on a national basis.

Tricon Metals and Services, Inc. — Bluefield, C.C. McCoy, Jr., founded 1967 — Steel fabrication including impact and abrasion resistant alloy steel in southwest Va. and southern West Va.

Rectron, Inc. — Williamson, Howard M. Lipps, founded 1965 — Fabricated steel and manufacturing of electrical equipment for mining industry in southern West Va. and eastern Ky.

Trojan Corp. — Uniontown, Pa., Mike Ballance — Manufacturer and distributor of blasting primers in western Pa., and northern West Va. (national headquarters in Salt Lake City, Utah.)

Viking Coal Co., Inc. — Kingwood, William G. Boyle, founded 1973—Underground mining in Preston and Monongalia Counties.

Weighing & Control Services, Inc. — Brandon, Fla., Paul E. Trinosky — Maintenance & Repair of conveyor weighing systems in eastern U.S.

COWACO — Charleston, Russell Hauth—Reprocessing of coal refuse, West Virginia and surrounding area.

Johnstown Coal Co. — Cabin Creek, John K. Skidmore, founded 1986—Surface mining in Kanawha and Boone Counties.

Coal Calendar

APRIL

21-23 Seminar, "Advanced Supervision," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

21-23 "Computer Analysis of Mine Ventilation Systems," University Park, Pa., contact R.L. Frantz, Penn State University, University Park, Pa., 16802, (814) 865-7472.

21-24 Short Course, "Surface and Groundwater Hydrology," Uniontown, Pa., contact OSM Technical Training Staff, 1951 Constitution Ave., Washington, D.C., 20240, (202) 343-1828.

27-28 Seminar, "Sales Skills," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

29-30 Seminar, "Keys to Customer Service," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

MAY

3-6 Coal Convention of the American Mining Congress, Cincinnati, Ohio, contact AMC, Suite 300, 1920 N St. NW, Washington, D.C., 20036, (202) 861-2800.

5-7 Seminar, "Successful Supervision," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

5-8 Short Course, "Surface and Groundwater Hydrology," Paintsville, Ky., contact OSM Technical Training Staff, 1951 Constitution Ave., Washington, D.C., 20240, (202) 343-1828.

11-13 Workshop on Planning and Design of Longwall Mining Systems, University Park, Pa., contact R.L. Frantz, Penn State University, University Park, Pa., 16802, (814) 865-7472.

12-13 Seminar, "What Every Supervisor Should Know About Maintaining Pro-Active, Union-Free Employee Relations," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

12-15 Short Course, "Engineering Principles Applied to Surface Coal Mining Operations," Morgantown, contact OSM Technical Training Staff, 1951 Constitution Ave., Washington, D.C., 20240, (202) 343-1828.

13-15 Short Course, "Surface Mine Blasting," West Virginia University, Morgantown, contact Department of Mining Engineering, WVU, P.O. Box 6070, Morgantown, 26506, (304) 293-0111.

14-16 Pace 1987, The Pike Area Coal Exposition, Pikeville, Ky., contact Pike County Chamber of Commerce, P.O. Box 897, Pikeville, Ky., (606) 432-5504.

18-20 Advanced Short Course on Coal Preparation, University Park, Pa., contact R.L. Frantz, Penn State University, University Park, Pa., 16802, (814) 865-7472.

19-20 Seminar, "Key elements in a Human Resource System," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

20-22 "Elements of Mine Monitoring and Control," University Park, Pa., contact R.L. Frantz, Penn State University, University Park, Pa., 16802, (814) 865-7472.

20-23 Eighth Annual Three Rivers Coal Festival, Fairmont, contact Pam Haymond, Festival Director, P.O. Box 1604, Fairmont, 26554, (304) 363-2625.

JUNE

1-3 "Computer Modeling of Subsidence With Spasid," University Park, Pa., contact R.L. Frantz Penn State University, University Park, Pa., 16802, (814) 865-7472.

2-4 Seminar, "Advanced Supervision," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

9-11 Seminar, "Successful Supervision," Boone Lake Training Center, Bristol, Tenn., contact SESCO Management Consultants, P.O. Box 1848, Bristol, Tenn., 37621, (615) 764-4127.

Coal Calendar

CONTINUED

11-13 6th Conference on Ground Control In Mining, Sheraton Resort and Conference Center, Morgantown, contact Department of Mining Engineering, West Virginia University, P.O. Box 6070, Morgantown, 26506, (304) 293-5695.

10-12 Seventh Annual "Better Reclamation With Trees" Conference, Executive Inn, Owensboro, Ky., contact James A. Vail, Madisonville Community College, University Drive, Madisonville, Ky., 42431, (503) 821-2250.

15-17 Short Course, "Production and Cost Management Techniques for Coal Mine Managers," Holiday Inn, Morgantown, contact Department of Mining Engineering, WVU, P.O. Box 6070, Morgantown, 26506, (304) 293-0111.

JULY

27-30 Short Course, "8th Applied Coal Mine Ground Control" Holiday Inn, Morgantown, contact Department of Mining Engineering, WVU, P.O. Box 6070, Morgantown, 26506, (304) 293-0111.

AUGUST

3-5 Short Course, "5th Longwall Mining," Holiday Inn, Morgantown, contact Department of Mining Engineering, WV, P.O. Box 7060, Morgantown, 26506, (304) 293-0111.

6-9 Annual Meeting, West Virginia Mining and Reclamation Association, Greenbrier Hotel, White Sulphur Springs, contact Patty Bruce, WVMRA, 1624 Kanawha Blvd. E., 25311, (304) 346-5318.

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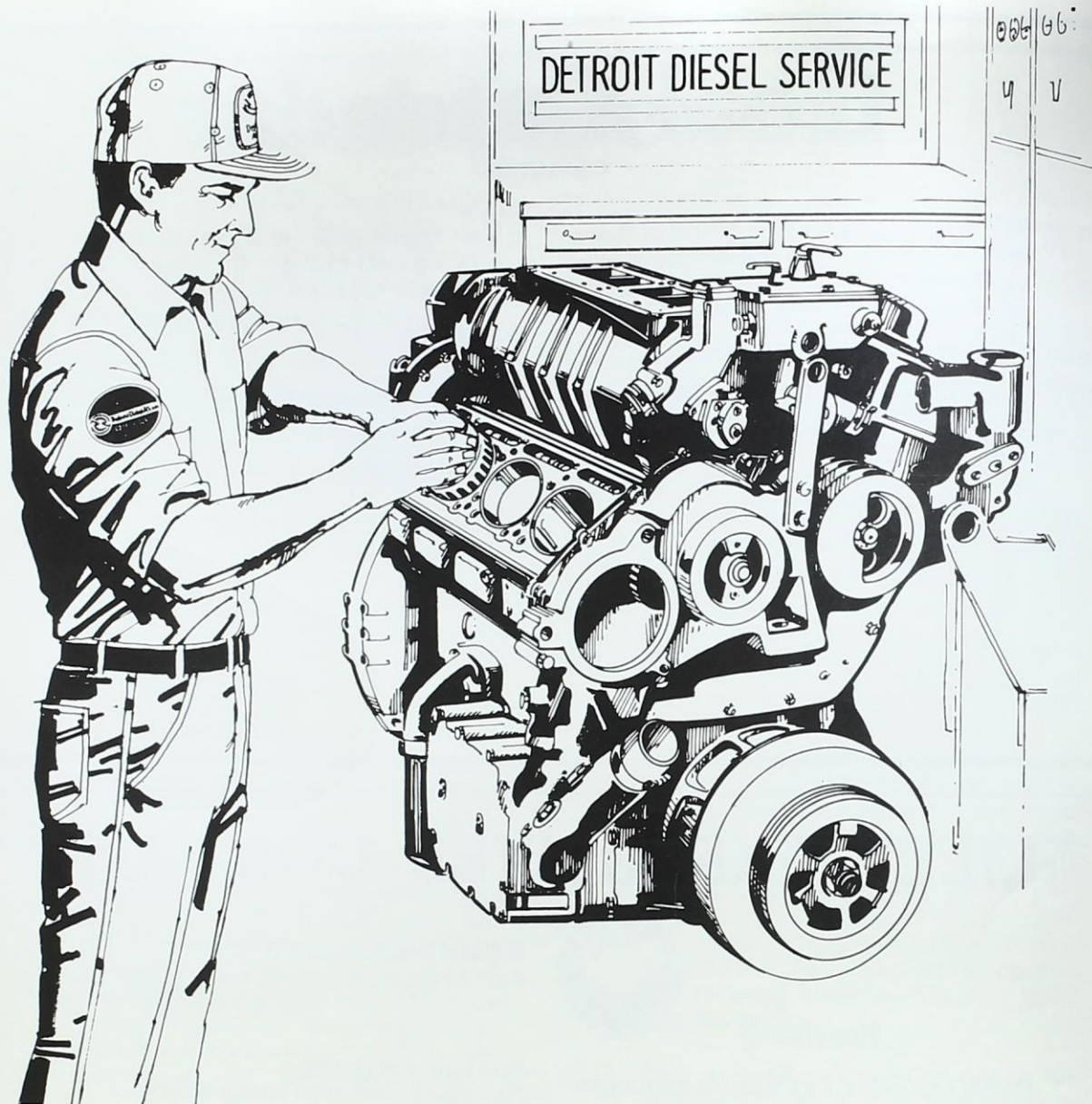
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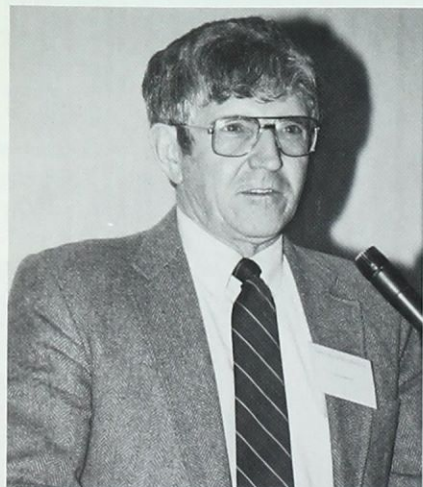
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Ray Sharp, CSX Distributing Service, Rail Transportation.



Ted Brisky, WVMRA Chairman.



State Senator J.D. Brackenrich.

Association Hosts 14th Symposium

The West Virginia Mining Symposium once again set attendance records in January, as 578 registered and attended the 14th edition of the two-day technical session.

"This was very probably the best attended event in our 20 year history," commented Association President Ben Greene. "As one member put it, when times are tough, you pay attention to detail, and that's basically what we had in mind as we put together our program. We were fortunate to have an excellent panel of speakers, who competently addressed those issues of concern to the industry as it struggles to survive the current round of adversity."

Titled "Taking Advantage," the Thursday morning program was devoted to a transportation panel, an update of trackage rights litigation, and utility coal purchase policies.

In the afternoon, focus shifted to

the Supreme Court, cost efficient equipment use, and wetlands treatment of acid mine drainage. Simultaneously, a special taxation session dealt with tax credits, new tax law benefits, and workers' and unemployment compensation.

An evening reception for the newly convened West Virginia Legislature was preceded by a legislative outlook from WVMRA members and new State Senators Tracy Hylton and J.D. Brackenrich.

As is customary, the second morning session concentrated on regulatory matters, specifically NPDES transfer, blaster certification, and an open forum with key officials from the West Virginia Department of Energy.

As always, the Symposium closed on a high note with the presentation of the 1986 Reclamation Awards, covered on the following pages.

DAVID C. CALLAGHAN AWARD BROOKS RUN COAL COMPANY

For overall excellence in the planning, implementation, and maintenance of combined mining facilities in Webster, Braxton and Nicholas Counties. Brooks Run has demonstrated a commitment to the future of West Virginia. In its ability to operate efficiently, it renews the faith of others in that future, and its consistent adherence to environmental integrity clears the path for others to do likewise. The outstanding record achieved by Brooks Run Coal Company reflects great pride on the coal industry, and upon the State of West Virginia.



Neil Pleasants (c) of Brooks Run Coal Co. accepts the 'David C. Callaghan' award from West Virginia Energy Commissioner Ken Faerber (l) and former DNR Director Dave Callaghan. Brooks Run was honored as the state's top mining operation for 1986.

Brooks Run Wins the 'Callaghan'

Fourteen West Virginia companies were honored with 1986 Reclamation Awards at the closing luncheon of the 14th Annual West Virginia Mining Symposium.

The awards are sponsored by the WVMRA, in conjunction with the West Virginia Department of Energy. Association President Ben Greene characterized the awards as symbolic of the pride which member companies take in the reclamation process.

"Over the years," Greene commented, "there has been tremendous pride attached to being a Reclamation Award winner. The general public just doesn't realize how many companies go far beyond legal requirements in completing their reclamation work. That

seems to be the most important criteria to those who are the nominated."

The award winners were selected from among more than 40 companies nominated for the honor by local DoE field inspection personnel.

DoE Commissioner Kenneth Faerber made the award presentations, including one to G.E. Ray Construction Co., of South Charleston, for its work in the Abandoned Mine Lands reclamation program.

The most coveted of the honors is the "Callaghan Award," won this year by Brooks Run Coal Co. for "overall excellence in the planning, implementation, and maintenance of combined mining facilities in Webster, Braxton, and Nicholas Counties."

Making this presentation was the man for whom it was named, former Department of Natural Resources Director David C. Callaghan.

Of the Callaghan winners, Greene said, "This is a very special award, because it identifies the winner as a company whose efforts and operating record prove its faith in the future of the West Virginia coal industry, and continuing commitment to outstanding reclamation and an attitude of partnership with the local community. Certainly Brooks Run has demonstrated these qualities and as such, is a most worthy recipient of the Callaghan Award."





HOBET MINING, INC.

For continuing excellence in the mining and reclamation of a 1000 acre tract in Boone County, where the company faced a lack of native topsoil, but nevertheless has created a haven for wildlife and an outstanding example of modern surface mine reclamation.



Ken Woodring of Hobet Mining, Inc. accepts the award from Commissioner Faerber.



Hobet was also recognized as the State's official nominee for a national reclamation award recently announced by the federal Office of Surface Mining.



GRAFTON MINING COMPANY

For consistently exceeding reclamation requirements in all phases of its Lewis County surface mine. The operation included a difficult stream relocation, which enhanced local water quality, and improved the aesthetics of the surrounding area.



Commissioner Faerber (second from left) presents a 1986 Reclamation Award to Jeff Compton (l), C.E. "Jim" Compton, (second from right), and James M. Compton (r), all of Grafton Mining.



**MARROWBONE DEVELOPMENT
COMPANY
EASTERN MINGO COAL CO.
REDBIRD CONSTRUCTION CO.**

For operating efficiency and environmental protection in the construction and operation of a raw coal transport area in conjunction with its underground mine in Mingo County.

Left to right, Kevin Maynard of Marrowbone Development Co., Commissioner Faerber, Ted Asbury, and Mike Castle, both of Marrowbone.



**ISLAND CREEK COAL CO.
ELM COAL CORPORATION
(Contractor)**

For the construction and maintenance of a rock fill containing 1 million yards of material, in conjunction with a surface operation which allowed the development of two underground mines and a permanent access road in Logan County.



Mike Jones of Island Creek Coal Co. accepts for Island Creek and its contractor, Elm Coal Corp.



PRESTON COUNTY COAL & COKE CORPORATION

For the efficient and conscientious implementation of an ambitious mining and reclamation plan on a 100 acre, environmentally sensitive site near Cheat Lake, in Monongalia County. The company's successful reclamation effectively complements the restoration of the Greer Mansion on the same property.

John Raese accepts the award for Preston County Coal & Coke Corp.



PEERLESS EAGLE COAL CO.

For truly outstanding drainage control, exceptional water quality and a company wide pride in the overall appearance of its underground mining complex in Nicholas County.



Richard Skaggs accepts for Peerless Eagle Coal Co.



John McDaniel receives the award on behalf of Dal-Tex Corp.

DAL-TEX COAL CORP.

For the reconstruction of a 60 year old preparation plant in Logan County, which resulted in substantial environmental improvements for the community of Monclo, and economically benefited the entire area.

*Not all machines qualify for the program. Some may require too many parts or too much labor to economically restore them to Caterpillar's rebuild standards. Others may be in too good a condition to warrant virtual "remanufacturing." At present, Caterpillar Certified Rebuild is available for qualified D8K, D9H, D9L, and D10 tractors. However, additional machine models are being anticipated as the program continues.

By Mike Majcher

Beckwith is one of the top Caterpillar dealers in the U.S. and has long been noted for its extensive capability to service, repair and rebuild Caterpillar equipment. With one of the largest Cat dealer parts distribution centers in the world, Beckwith maintains over 50,000 items in stock as well as having eight full service branch locations and three major rebuilding facilities in western Pennsylvania.



Of Beckwith's 750 full-time employees, over 200 are mechanics who have an average of 15 years service with the company—a major factor in Beckwith's rebuilding capability. In fact, these same skilled Beckwith personnel continue to rebuild all types



of Caterpillar equipment. This capability has been a vital factor in maintaining Caterpillar equipment in this area for years.

Now, however, Beckwith provides Caterpillar owners with a choice of rebuilding programs. And, with the extensive new Caterpillar Certified Rebuild, they get:

- Like-New performance and machine availability from their present Caterpillar equipment
- Ownership at a fraction of new machine cost
- And a Like-New warranty, too!

Here's how it works:

STEP ONE

Inspection and estimate.

Your tractor* is examined thoroughly by Beckwith service technicians. Operational and visual checks are made and maintenance records are examined. Oil sampling is conducted to determine the machine's internal condition. A written Condition Appraisal Report is then prepared as the basis for determining rebuild candidacy and cost.



STEP TWO

Disassembly of the machine and its components.

Beckwith strips your tractor to the bare frame. All components are removed and disassembled. Certain parts, such as hoses, belts, seals, and bearings are summarily replaced. Others are carefully inspected and measured against Caterpillar Parts Reusability Guidelines. Those which do not meet reusability standards are replaced with only genuine new, Exchange or Caterpillar Remanufactured Products.

Scores of parts, including all critical product improvements, are installed to meet Caterpillar Certification standards.

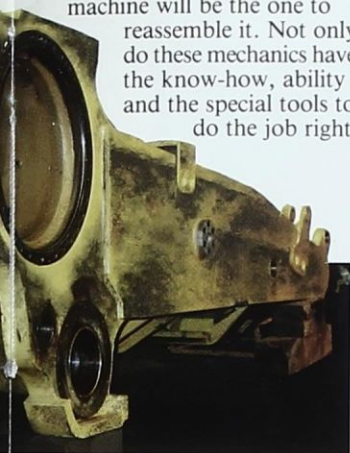
The main frame and tractor roller frames are completely disassembled and sandblasted to allow intensive structural examination for cracks, undue wear and straightness. They are welded, straightened and reinforced wherever needed to help ensure the structural integrity of the unit.

Instruments and controls are removed, inspected and replaced upon requirement. Worn linkage and pins are replaced so that controls operate with precision.

STEP THREE

Reassembly by experienced mechanics using special tools.

Usually the same Beckwith team that disassembled a machine will be the one to reassemble it. Not only do these mechanics have the know-how, ability and the special tools to do the job right,



they'll know your tractor better than anyone! And they are Beckwith professionals. That's why you can be sure they will check and inspect all major parts and components with an exacting eye before and after installation.

And, Beckwith mechanics will check and recheck all critical torques, clearances and pressure settings to make sure your rebuilt Caterpillar tractor will perform with the like-new production capability you can expect from a Caterpillar Certified Rebuild.



STEP FOUR

Attachments mounted and day-long performance tests conducted.

Inspections and tests made during reassembly and afterward are now verified as meeting Caterpillar standards and specifications. Then extensive testing is conducted with machine attachments in place to verify the absence of leaks, proper turbocharger boost, throttle response and proper transmission and steering clutch pressures.

Such rigid performance testing assures that all instruments and operational functions meet Caterpillar Tractor Company requirements for on the job reliability.

STEP FIVE

Painted, re-identified and warranted.

Caterpillar issues a new identification number for your tractor which certifies that the rebuild process has been completed in

accordance with Caterpillar Certified Rebuild specifications and the tractor is given like-new warranty.

This special new identification is applied over a fresh, new paint job to mark your machine as a Caterpillar Certified Rebuild with new resale value and warranty—ready to perform like new.

The choice is yours.

No longer is a Cat owner faced with having to trade-in equipment that has become less productive and more expensive to maintain after thousands of hard working hours on the job. He can



choose a Beckwith rebuild—the same fine quality rebuild performed by Beckwith for all types of Caterpillar tractors, or the new Caterpillar Certified Rebuild—done to Caterpillar specifications

and offering a new I.D. and like-new warranty. These programs are a testimony to the value inherent in new Caterpillar equipment—the same value that Beckwith has been selling for the past 61 years!

In either case, Beckwith offers owners the real economical advantage of their built-to-be-rebuilt Caterpillar tractor's quality and design. It's true!


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U.S. STEEL MINING CO., INC.

For outstanding efficiency and environmental concern, as demonstrated by the timely regrading and reseeding of mined areas on the company's mountaintop removal operation in Kanawha County.



Jim Canterbury (r) accepts for U.S. Steel Mining Co., Inc.



**SPECIAL AWARD FOR AML
PROJECT
G.E. RAY CONSTRUCTION CO.**

For the timely, efficient, and complete reclamation of the Norton Mine Drainage Project under the Abandoned Mine Lands program. The company's success in addressing the complex environmental problems presented by this Randolph County project has resulted in flood prevention, an increase in useable wildlife habitat and recreation areas, and other measurable environmental benefits, including the elimination of the discharge of suspended solids in the Tygart Valley River.

Left to Right, Dave Brochart of DoE, the Commissioner, Jim Ahern of G.E. Ray Construction Co., and Dave Pybus of DoE.



EASTERN ASSOCIATED COAL CORPORATION

For excellence in the design and construction of a major preparation plant in Boone County, where the company's long term investment in state-of-the-art technology has achieved an efficient operation with effective environmental control.



Paul Jesko (c) and Richard Trigg (r) accept the award on behalf of Eastern Associated Coal Corp.



Ed Suter (r) accepts for Consolidation Coal Co.

CONSOLIDATION COAL CO.

For environmental concern and reclamation efforts far beyond legal requirements in the restoration of a 30 acre refuse pile in a commercial district of Moundsville, in Marshall County. The company demonstrated an approach to community partnership in which the entire industry can take pride.



P.C.R.

For diligent attention to the surrounding residential community in the reprocessing and reclamation of a 10 acre refuse site in Fayette County.



Jeffry Almond (r) of Aren & Associates accepts for P.C.R.

West Virginia Mining and Reclamation Association

Presents This Certificate To



Coal Corporation of America, Inc.

For excellence in the construction of a valley fill and related drainage structure, and the prompt revegetation of the disturbed area on its 70 acre permit in Webster County.

Ben Greene
PRESIDENT

JF Brisky
CHAIRMAN OF THE BOARD



West Virginia Energy Commissioner Ken Faerber makes the presentation to Ernie Collins (r) of Coal Corporation of America, Inc.

COAL CORPORATION OF AMERICA, INC.

For excellence in the construction of a valley fill and related drainage structure, and the prompt revegetation of the disturbed area on its 70 acre permit in Webster County.



Figure 1. Cattails growing in AMD. Note the precipitation of iron.

A Biological Alternative to Conventional AMD Treatment

By Dr. Robert L.P. Kleinmann

Research Supervisor, Environmental Technology

Bureau of Mines

US Dept of the Interior

General Comments

Chemical treatment of acid mine drainage (AMD) costs the mining industry over one million dollars a day. Moreover, the long-term liability of continued acid water treatment at many inactive sites, coupled with the lack of bond release, casts a long shadow over the future of Appalachian coal mining. The ideal solution would be a method that would stop the AMD-producing pyrite from oxidizing. Failing that, one might wish for an inexpensive "black box," into which AMD flows, to emerge subsequently, purified. The appeal of

biological treatment is that in many ways it resembles that idealized "black box," for it is inexpensive, requires virtually no addition of chemicals and appears to work by magic.

Biological treatment, using iron-oxidizing bacteria and techniques borrowed from the sewage treatment industry, was repeatedly investigated during the 1960's and 1970's but never produced a practical technique. An alternative approach, utilizing small marsh ponds constructed primarily for AMD treatment, has recently been developed and appears to be much more successful. However, there have been failures, and anyone who believes that

all they have to do is plant a few cattails in an old sediment pond and walk away is going to be disappointed.

The use of constructed biological systems for treatment of stormwater and municipal or industrial wastes, while not conventional, is well demonstrated. However, it has only been in the last few years that anyone thought to treat AMD this way. Independent studies at natural wetlands in Ohio and West Virginia by researchers at Wright State University and WVU in the late 1970's indicated that: first, no damage was done to *Sphagnum* (peat moss) bogs by moderate flows of AMD and second, that AMD was naturally

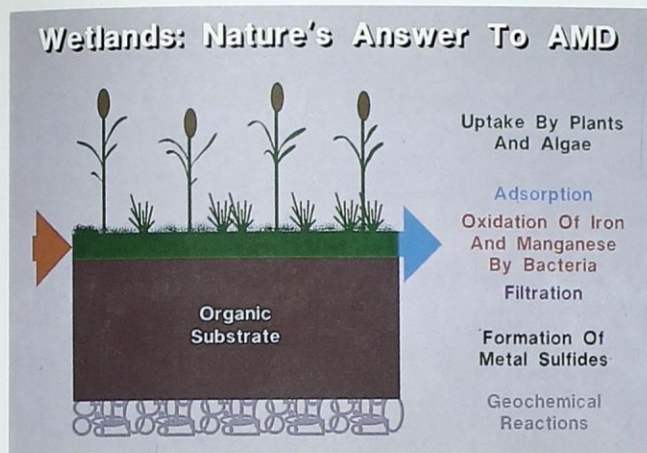


Figure 2. Wetlands: Nature's Answer to AMD.

purified by passage through such a bog. Subsequent observations at sites where cattail plants had volunteered indicated that these acid-tolerant marsh plants could also improve AMD water quality.

Based on these observations, pilot-scale tests were constructed in the early 1980's, followed by full-scale field trials undertaken by industry starting about three years ago. Initial attempts focused on volunteer marshy areas that could be augmented by retarding and spreading out the water flow. However, the use of natural wetlands for acid water treatment is seldom an acceptable option. Subsequently, biological systems have been constructed in remodeled sediment ponds or shallow, excavated areas. At some sites, the vegetation died. At other sites, the vegetation thrived but water quality improved only slightly. However, at many sites, water quality improved significantly.

Failures and successes have all been instructive. There are now over 100 biological systems constructed on mined land specifically for the purpose of treating AMD. All are at least partially successful, thereby reducing water

treatment costs; many are functioning so well that the water can be discharged without any chemical treatment at all. It is too early to extrapolate these results into the indefinite future, but abandoned mined land (AML) programs in various states have started to construct wetland systems, due no doubt to the lack of suitable alternative control techniques.

Since this approach to AMD treatment is so new, there are many more questions than answers, especially when one asks how the system works. But researchers are beginning to open up the "black box", peering in and learning by observation and experimentation. Looking first at the plants, one finds that wetland species remove metals from acid water by adsorption (especially ion exchange), consumption (plant uptake) and simple filtration. Different plant species vary in their primary metal removal mechanism and relative efficiency. For example, *Sphagnum* species have high surface area and are extremely effective as ion exchange media. In addition, *Sphagnum* is also a good filter for ferric hydroxide particulates. In contrast, cattails do not

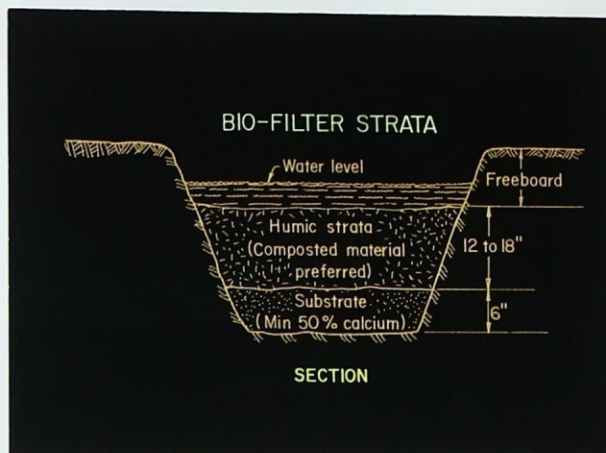


Figure 3. Cross-section of a typical constructed substrate before planting.

have a lot of surface area but do take in iron and manganese. Researchers at Clarion University found that the rhizome tissue of cattails grown in AMD contained as much as 300 ppm Fe and 200 ppm Mn. Leaves from these plants contained 45 ppm Fe and 52 ppm Mn. A recent analysis by D. Kepler (EAD's Group) from a wetland that is removing manganese from mine water demonstrated phenomenal accumulation of Mn—concentrations as high as 56,000 ppm (dry weight) were recorded.

Iron and manganese oxidizing bacteria are also very active in these acidic wetlands; so much so that some researchers believe they are the most critical aspect of metal removal in the cattail marsh. The late Prof. Stone, of Pennsylvania State University, showed that increased numbers (and presumably, activity) of these bacteria were associated with higher rates of removal of the metals, though one cannot necessarily conclude a causal relationship.

In the organic-rich substrate, other bacteria are active, converting the sulfate component of mine water to hydrogen sulfide. This in turn reacts



Figure 4. The plot in the foreground was planted in hay composted for 3 months; the plot in the background was planted in hay composted for 8 months.

with dissolved metals, adsorbed metals, and precipitated metals to form insoluble metal sulfide compounds. Such also may be the eventual fate of much of the metals removed from the acid water, as dead metal-laden vegetation sinks beneath new growth. Adsorption by the organic substrate (especially peat) can also be very high.

Finally, there are geochemical removal mechanisms occurring in the wetland which may be significant. For example, the cattail marshes that are most successful in removing manganese all have an incorporated layer of limestone beneath the organic substrate. This produces an environment of near-neutral pH and high CO_2 concentrations (due to neutralization reactions) that may, in turn, cause the precipitation of manganese carbonate. Thus, from top to bottom, these acidic wetlands appear to offer a multitude of mechanisms for metal removal. We cannot, at this time, say that we truly understand the relative importance of these various functions, but (with the confidence of fools who tread where angels fear to go) we have learned to work with these mechanisms

and to construct biological treatment systems on mined lands.

Specifics

Despite the demonstrated capability of natural *Sphagnum*-dominated bogs to treat AMD by cation exchange, attempts to create these bogs to treat AMD have generally failed. The *Sphagnum* are very vulnerable to the changes of water level that are common at mine sites. Recent field trials, with good control of water level, indicate that *Sphagnum* or mixed plant species systems can work, but at this point the principal advantage of *Sphagnum* would appear to be its tolerance to extremely low pH.

At a pH of 3 or above, the marsh-type wetlands have had better success. The enclosed sketch illustrates a typical substrate (used initially by B. Pesavento-Environmental Analytic) for these constructed systems. The limestone, incorporated in the deeper "root zone," provides neutralization since it is in a reducing (low oxygen) environment and therefore not vulnerable to ferric hydroxide armoring; continued monitoring is necessary to determine

how long this effect lasts. It should be pointed out, however, that many successful systems have been constructed without the limestone base.

More important to the success of the system is the use of well-composted organic material. Side-by-side tests in Maryland using hay composted for three and eight months, indicates that additional composting results in much better growth of cattails.

Depth of water is also critical. Although the cattails will grow well in water that is as deep as two feet or more, AMD treatment efficiency is inconsistent. Metal removal is most efficient when the water is a mere 2-4 inches deep. The wetland shape is determined by the area available. To maximize flow path length and detention time, a series of rectangular ponds or channels is more space-saving than a design simulating the irregular perimeter of a natural wetland. On the other hand, if flow can be spread over the entire wetland width, an irregular perimeter in a large ($1/2$ acre or more) wetland can increase flow path length and detention time, provide water storage space during high flow periods, and encourage wild life access



Figure 5.

to the wetland system.

Although a few high flow systems (over 100 gpm) have recently been established, constructed wetlands would appear to be best suited for seeps and small flows of AMD. Most systems have multiple ponds to minimize short circuiting and to utilize the available area efficiently. As one would expect, for any given flow, increasing the size of the constructed system increases metal removal. Almost half of the known biological treatment systems constructed for AMD treatment have been inventoried by the Bureau of Mines. The typical site contains 3 ponds, and is treating between 20-30 gallons per minute (gpm) in a total area that allows an average over 600 sq. ft. per gpm.

The general metal of concern is iron, with influent concentrations ranging from minor amounts to over 200 ppm. In about half the wetlands, iron is reduced to below 3 mg/L, though the range of iron removal observed extends from 34 to 99 pct. Manganese removal is, however, limited by the presence of iron. If both metals are of concern, the wetland system must be designed to remove the metals

in order (iron first, then manganese). D. Kepler (EADS Group) has found that manganese removal improves when the cattail vegetation is sparse, since that allows more algal growth. Thus, one should design a system that includes lush growth for iron removal followed by a shallow, high-nutrient, open-water area for manganese removal. Figure 5, a marsh constructed by TVA, illustrates this concept. Note the iron removal in the vicinity of the cattails, followed by flow through the shallow open area in the foreground.

At about two-thirds of the sites, pH increases as the water moves through the wetlands, including some sites where no limestone was incorporated. Only at a few sites has limestone riprap been placed down-gradient of the wetland to provide additional neutralization; limestone should not be added until the iron in the water is being consistently reduced to 2 mg/L or less.

Final Comments:

The further development of biological technology for treatment of acid mine water awaits definition of op-

timal rates for different vegetation and substrate types, and evaluation of long-term effectiveness. Research to date indicates that with flow control, metal, sulfate, and acidity removal can be expected in an established constructed wetland. It is expected that research and development in this field will increase in the coming years to meet the demands of mining companies and government agencies. However, it is apparent that industry can not sit back and wait for the research to be completed. Based on the number of inquiries that the Bureau of Mines has received, the number of biological systems constructed for AMD treatment will double during 1987, as it has in the previous two years. Further research is being conducted at the Bureau of Mines, at several universities and at many mine sites. The result from this research will be presented at a major technology transfer conference at the Convention Center, Pittsburgh, April 19-21, 1988, that will feature treatment of AMD in constructed wetland systems, as well as other aspects of mine water and reclamation.

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
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DoE Deputy Director Bart Lay (l) and DoE Mines and Minerals Director Mark Scott (2nd from l) present the Mountaineer Guardian to (l-r) Don Cussins, John Geroski, and Melvin Judy of Buffalo Coal Co.

33 WV Operations Make 'Mountaineer Guardian' Honor List

Thirty-three West Virginia mining operations have received the prestigious "Mountaineer Guardian Award" for mine safety.

Bart Lay, Jr., deputy director for the Health, Safety & Training for the West Virginia Department of Energy, made the presentations at a special luncheon, as part of the 14th annual West Virginia Mining Symposium at the Holiday Inn-Charleston House.

Sponsored by the Association, in conjunction with the West Virginia Department of Energy, the Mountaineer Guardian program recognizes those

mining operations which achieve specified tonnage goals, based on employment, without incurring a fatal accident.

Since the program was initiated four years ago, some 158 operations have been recognized.

The most recent awards represent nearly 80 million tons of coal produced without a fatality. Among the honorees were nine Association members.

According to Vice-President Bill Raney, the program has been an important factor in the industry's outstanding safety record. "The six safest years on record in West Virginia mines are

1981, 1982, 1983, 1984, 1985, and 1986."

"Obviously, many factors are involved," Raney continued, but no matter how many safety laws we have on the books, the keys to reducing fatalities will always be the individual's use of safe work principals, and the cooperation necessary to safe working conditions.

"That's what this award is all about, and that's why every employee of every company that we recognize has reason to be proud.



Tracy Hylton (l) of Perry & Hylton, Inc., accepts the Award from Bart Lay and Mark Scott of WV-DoE.

Award Winners – January 15, 1987



Amherst Coal Co.-Paragon Mine-**Logan** County
 Amherst Coal Co.-Lundale No. 3A-**Logan** County
 Badger Coal Co.-Grand Badger No. 1-**Upshur** County
 Buffalo Coal Co.-Grant, Preston, Tucker Operation- **Tucker** County
 C.W. Bentley, Inc.- Randolph Mine- **Randolph** County
 Cannelton Industries, Inc.-Mine No. 130-**Kanawha** County
 Carter-Roag Coal Co., Inc.-No. 1-A Mine-**Randolph** County
 Clines Coal, Inc.-No. 4 Mine-**Boone** County
 Consolidation Coal Co.-Pursglove No. 15 Mine-**Monongalia** County
 Consolidation Coal Co.-Robinson Run No.95-**Harrison** County
 Consolidation Coal Co.-Arkwright No.1-**Monongalia** County
 Consolidation Coal Co.-Ireland Mine-**Marshall** County
 Consolidation Coal Co.-Blacksville No.1 Mine-**Monongalia** County
 Hansford Coal Co.-Mine No.1-**Kanawha** County
 Hill Enterprises, Inc.-Dorsey No. 1 Mine-**Nicholas** County
 Laurel Creek Mining Co.-No. 1 Mine-**Boone** County
 Maple Meadow Mining Co.-Cannelton-Maple Meadow Mine-**Raleigh** County
 Masteller Coal Co.-Hampshire Hill Surface-**Mineral** County
 Omar Mining Co.-Chesterfield No. 11-**Boone** County
 Omega Mining Co., Inc.-Omega No. 100 Mine-**Monongalia** County
 Pamliid Coal Co.-No.5-B Mine-**Braxton** County
 Panther Creek Coal Co.-No. 4 Mine-**McDowell** County
 Perry & Hylton, Inc.-Cazy No.1-**Boone** County
 Pratt Mining Co.-No.7 Surface Mine-**Kanawha** County
 Rush Run Coal Co.-No. 3 Mine-**Boone** County
 T&T Energy, Inc.-No. 1 Mine-**Preston** County
 Terry Eagle Coal Co.-Robert Eagle No. 2-**Nicholas** County
 U.S. Steel Mining Co, Inc.-No. 14-4 Mine-**McDowell** County
 U.S. Steel Mining Co., Inc.-No. 4 Mine-**McDowell**
 Virginia Crews Coal Co.-No.4 Mine-**McDowell** County
 Westmoreland Coal Co.-No. 7 Mine-**Nicholas** County



Marty Burke (l) accepts for Pratt Mining Co., and Hansford Coal Co.



John Bryan (l) accepts on behalf of Badger Coal Co.



Monte Hieb (l) accepts the Mountaineer Guardian for Terry Eagle Coal Co.



Charles "Skip" Green (l) does the honors for Cannelton Industries.



Gary McNeil (r) receives Amherst Coal Co.'s award for its Paragon Mine.



Hershel Carter accepts the Mountaineer Guardian for Amherst's Lundale No. 3A Mine.

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BRIDGEPORT, WV
515 W. Main St.
304/842-3511

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

COEBURN, VA
Rt. 72, Wise Mtn. Rd.
703/395-6901

BLUEFIELD, WV
Airport Rd. near U.S. 52
304/325-6131

PARKERSBURG, WV
State Rt. 14
304/422-8441

FROSTBURG, MD
101 Frostburg Ind. Pk.
301/689-2211

SALEM, VA
2508 W. Main St.
703/389-9375

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

Address Correction Requested

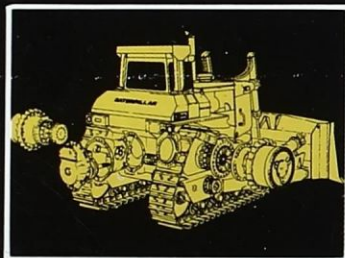
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D8L

Even More Production



10-20% more in pushloading
20-40% more in dozing
20-30% more in ripping

It all happens because the Caterpillar D8L track-type Tractor has the new shape of value. A dramatically improved design first proven by the D10, then refined with the D9L. One that makes it far more productive than its conventionally designed predecessor, the D8K.

The D8L handles tougher jobs with its 11% greater weight and the 12% more horsepower from its Cat 3408 diesel Engine. There's better traction, too, because its suspended undercarriage conforms to uneven ground contours. And improved blade penetration and faster cycle times give you even more production advantage.

The new shape of value also means lower costs. Fuel consumption is down 10-20% per unit of material moved. The elevated sprocket keeps final drives up and out of abrasives . . . and isolated from ground shock. Floating action of the bottom rollers reduces impact loads by up to 50% for longer component life.

Servicing is greatly simplified by the D8L's modular design. Profit-stealing downtime is drastically reduced from days to hours. For instance D8L final drives can be removed and installed in five manhours, instead of the typical 45 hours for the D8K.

These and more D8L advancements add up to more production . . . and low lifetime costs.

Power: 335 HP/250 kW
Weight: 93,276 lb/42 310 kg


WALKER MACHINERY

Charleston, WV
Beckley, WV

Parkersburg, WV
Summersville, WV
Logan, WV



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