

Trip Report - TVA and IFDC  
Muscle Shoals, Alabama  
October 5 - 11, 1980

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Objectives:

1. To discuss progress and plan upcoming activities with TVA staff working on RSSA.
2. To attend TVA Biennial Technology Demonstration
3. To be A.I.D. observer at the Annual Board of Directors Meeting of IFDC.

Contacts:

TVA - Dr. Conrad Kresge, Dr. Darrel Russell, Mr. John Shields and Dr. Frank Johnson.

IFDC -Dr. John A. Hannah, Chairman of the Board, Dr. Webster Pendergrass, Mr. Richard Freeman, Dr. Robert Wagner, Dr. S. K. Mukherjee, Dr. Bukar Shaib, Dr. David Hopper, Sir John Crawford, Dr. Ibrahim shihata, Dr. Ola Heide and Dr. Elesio Restrepo of the Board of Directors. Dr. Donald McCune, Mrs. Majorie Engel, Dr. Paul Stangel, Mr. Owen Livingston, Dr. William Bishop and Dr. Dennis Parish.

Results and Observations:

TVA's range of experience on which AID might draw extends far beyond that related directly to fertilizers covered by the present RSSA. For 1983 we should consider a basic revision of this activity to include the watershed development work, forestry, farm planning and rural industry development. Although TVA also has outstanding capability in power engineering and industrial pollution control, this would not be appropriate for coverage through DS/AGR. It might be considered by DS/ENGR.

The development workshop just completed at TVA highlighted the broader aspects of Valley development and the synergistic relationship between a regional development organization, such as TVA, and the agricultural schools, including the 1890 universities. The interaction between the research program, agricultural extension and agro-industry produced far more rapid and significant change than could have been achieved by the same agencies working independently. Non-farm development also played a vital role in farm progress. For example there are many successful part-time farmers who could not have survived on the income from their farms alone.

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Progress on the study of the role of fertilizers in India's agricultural development was discussed. It was agreed that one of the RSSA team should go to India at the time of the 25th Anniversary meeting of the Fertilizer Association of India to collect material for this report from official sources and through interviews of past and present industry and government officials who were and are directly involved with fertilizer research, promotion, production and import. A few key individuals not already known to the RSSA group were identified.

Development of more functional granule/particle size specifications for AID procurement was discussed. The problem with the AID standards was called to our attention when a recent fertilizer shipment to Zambia failed to meet specifications but neither failure in handling properties could be observed nor could a loss of agronomic value be attributed to the deviation.

Dr. Frank Johnson relayed a complaint of a manufacturer of diammonium phosphate that some companies were basing moisture determinations on unground samples and reporting improbably low results. I agreed to obtain a collection of unground DAP materials from various sources which could be used by Dr. Johnson's group to establish the range of moisture in commercial DAP whether or not AID specifications fell within the normal industry range or were unduly strict.

The debut of the ammonia from coal plant was the highlight of the TVA New Technology Demonstration. Although the initial startup was for the demonstration, it appears that the plant will run successfully. Such a plant, while more costly than one based on natural gas or oil, would depend on our most abundant fossil fuel and a fuel available in many oil poor countries. With the rationalization of energy prices coal technology is becoming competitive. The present plant of semi-commercial scale, 135 tons of ammonia per day can be used to test coals with a wide range of properties. The high temperature burner leaves no potentially toxic organic residues. The mineral matter is drawn off as a slag. All sulfur is removed from the synthesis gas and recovered as elemental sulfur. Only twenty five gallons of water per hour is discharged and this is treated both chemically and biologically to meet the most stringent health standards.

The new falling curtain urea granulation process was also demonstrated. This is especially relevant to AID. It will produce a product of uniform size which is hard and dense. It will perform better in mixtures, handle and store better than

prilled urea and will require less space for shipping allowing substantial savings in ocean freight. Other processes for producing high analysis mixtures were technically interesting but may not have an immediate impact on AID's program.

The IFDC welcomed new members to the Board of Directors: Dr. David Hopper of IBRD, Canadian; Dr. Alesio Restrepo of Monomeros, Colombian; Dr. Ola Heide of National University of Norway; and Dr. Bukar Shaib Advisor to the President of Nigeria; Dr. Ibrahim Shikata of the OPEC Fund holding joint Kuwait and Egyptian citizenship. Dr. Hopper was elected as Vice Chairman succeeding Dr. Webster Pendergrass whose term expired this year. Dr. Pendergrass will continue to serve IFDC and the Board as a Founding Director.

The IFDC budget for CY 1981 is \$8,029,745. The allocations among technology, agro-economic research and development and outreach activities remains roughly the same. Administrative and unallocated operational expenses constitute about 20 percent of the budget. Cost of living adjustments for salaries were authorized at 8.4 percent. An additional 1.6 percent increase in the salary budget was authorized to provide for merit raises. Increases in the cost of international travel are becoming a major budgeting problem. General inflation is eroding the value of the core funding which support the more basic research.

The program review this year was illustrative rather than attempting to be comprehensive. The economic research, sulfur program, phosphate development and specific training efforts were highlighted.

The study of the equity impact of fertilizer use in Bangladesh adds support to results from other studies in India and Pakistan. Small farmers in Bangladesh were found to be using more fertilizer per acre than large ones, they were getting greater increases in yield per unit of fertilizer applied and earned more per acre than the larger farmers. Even when farming as share croppers and giving half of the crop to the landlord small farmers, those with 2 1/2 acres or less, earned as much per acre as farmers with 5 or more acres.

A workshop is urgently needed to draw attention to the sulfur deficiency problem in the tropics and to gather existing information about sulfur into a readily accessible reference volume. Sulfur shortage is especially a problem in the tropics and the southern hemisphere where industrial development is minimal. Sulfur is easily leached from the soil. It is a key element in both plant and human nutrition. As sulfur is removed

from or left out of high analysis fertilizer special provision must be made to include it in the fertility program to correct the deficiency. New products designed for general distribution in the tropics should supply a minimum of 10 kilograms per hectare for grains and 20 kilograms or more for legumes.

The phosphate program at IFDC has attracted the greatest number of restricted grants and contracts. Work is in progress with ores from 10 countries. The feasibility of using local rocks in both Colombia and Sri Lanka has been demonstrated. For Colombia it was demonstrated the Sardinata rock could be substituted entirely for imported rock although early tests by plant operators in Colombia were unsuccessful when more than 5 percent Sardinata rock was employed. There are two feasible routes for solving the problem of bound chlorine in the Sri Lanka rock. Either specialized processing equipment may be used to control corrosion or the rock may be used to produce single or triple superphosphate employing imported acid or acid made from imported rock.

The increased demand for IFDC training is strong evidence of the success of the program. Heterogeneity of participant training, experience and extremes in language competence have been major obstacles in the training courses. Of nine courses offered in 1980 four will be at Muscle Shoals and five overseas. Informal and individualized training meets the specialized needs of many other people. Last year IFDC had over 400 visitors from 63 countries other than the U.S. Over 600 are expected before the end of this calendar year.

An ammonia from coal report is attached. The full briefing book for the Board of Directors of IFDC is available in my office.

John Malcolm  
10/28/80

DS/AGR/RNR:JLMalcolm:ap:10/28/80

news

# Ammonia From Coal Starts Up

The big plant is readying for its official debut—slowly, methodically, one step at a time.

Ammonia from Coal, the first completely integrated coal gasification facility in the United States, is preparing for startup. People around the world are phoning, asking to see.

They will see a complex of buildings, structural steel, piping, and vessels which cost about \$43 million. An additional \$20 million has been budgeted for a three year demonstration run. Ammonia from Coal is a \$63 million project at the National Fertilizer Development Center in Muscle Shoals.

It will manufacture a product no one will ever see—ammonia.

Ammonia is a colorless gas. For handling, it must be kept under pressure in pipes and tanks.

It takes ammonia to make nitrogen fertilizer. Nitrogen is the most important fertilizer element in producing U.S. food and fiber. Ammonia from Coal has a top priority in the nation's food production picture.

The key word is coal.

**Eight Tons an Hour.** NFDC's new plant will consume eight tons of coal an hour to produce 10 million cubic feet of gas—a mixture of hydrogen and carbon monoxide—per day. That amount of gas will produce 135 tons of ammonia per day to be used in the production of fertilizer.

The focus is on the feasibility and the costs of producing ammonia from coal, rather than natural gas. Coal is abundant; natural gas is getting scarce—and expensive.



Project Manager Don Waitzman

*“You run the front part of the plant, then go on to the next part until it's all working.”*

The energy implications for the fertilizer industry are tremendous.

Don Waitzman, project manager for Ammonia from Coal since the project began in 1975, says his operating personnel have been working round the clock since August 30 in these final phases of construction.

When the plant at last comes into production, there will be no flick of the switch, no flashing lights, Waitzman says. The plant is going "on line" in sequential steps. "You run the front part of the plant then go on to the next part until it's all working," Waitzman said.

Waitzman is describing the project from his office in the old Medical building that has been Ammonia from Coal's command post for many months.

His phone rings. There is a request from a group of international visitors to come to Muscle Shoals to see the plant. Already, groups from Japan, France, and Spain have asked to visit.

**Ready For Visitors.** Ammonia from Coal's personnel are now preparing two slide-tape presentations for visitors. One is highly technical, the other, a presentation designed for the general public.

Specific data on the project is being assembled in book form, Waitzman said.

The big TVA plant will use the Texaco Coal Gasification Process, developed by Texaco Development Corporation, Waitzman said. The technology's history goes back to the early 1930's when the Germans developed a method of making various chemicals from coal.

Brown & Root Development, Inc., of Houston, Texas, was awarded a \$26.5 million contract for construction of the coal gasification and gas purification facility. Actual construction was subcontracted to Mid-Valley Inc. of Houston.

Air Products and Chemicals Inc. re-

ceived the \$5.6 million contract on the air separation plant required to provide high purity oxygen and nitrogen for the process. TVA forces provided about \$11 million worth of services to complete the project.

At the heart of the process will be the huge gasifier which arrived at NFDC last May. The gasifier will be preheated to more than 2,200 degrees Fahrenheit to receive a paste-like mixture of coal and water, called a "slurry." The thick black paste will be pumped into the gasifier, together with pure oxygen to produce the needed chemical reaction.

David Nichols, a project engineer for the facility, said the coal, water and

At the site: Ammonia from Coal project management team members, from left, Bob Lee, David Nichols, George Spickard and John Burnett. Not pictured is Phebus Williamson.



oxygen will "react" under 500 pounds of pressure to produce simple gases; carbon monoxide, carbon dioxide, hydrogen and steam.

**Here's What You Need.** "We'll be using almost a ton of oxygen to a ton of coal," Nichols said. "The gases come out mixed together. We want the hydrogen and carbon monoxide. Carbon monoxide can be reacted with steam in another large vessel to make hydrogen gas. Hydrogen gas is what you need to make ammonia."

The plant is designed to use Illinois No. 6 coal initially, a coal selected because it has the largest reserve in the United States and is located in the Midwest, where there is the greatest consumption of fertilizer. Later a variety of other coals will be used, also.

The project's operating personnel will include some 50 operations and maintenance people, including a foreman and six operators for each shift; shift engineers and technical persons, members of Ammonia from Coal's project management team and staff; and a full-time maintenance crew.

Out of the original project management team assigned to Ammonia from Coal in 1975, five—Waitzman, Spickard, Williamson, Nichols, and Lee—are still at the helm. Blouin has returned to research work.

"We've had as many as 300 individuals working together since Ammonia from Coal began on October 27, 1975," Waitzman said. "We obtained people from various branches as we needed them. As one phase was completed, we'd return that group to their branch and send for another with a particular kind of expertise. Our Design Branch has been heavily involved throughout the project."

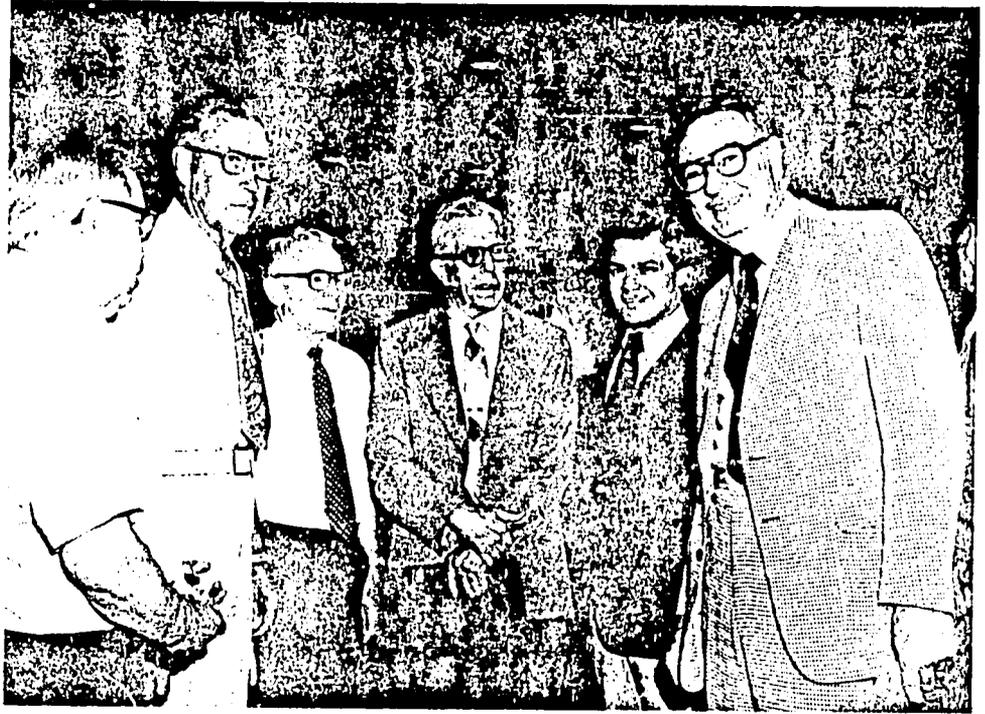
With NFDC since 1962, Waitzman says, "I've made my living most of my adult life building plants!" He was in charge of design and construction of NFDC's granular combination fertilizer unit, nitric acid unit, and urea unit before being assigned to Ammonia from Coal.

**"We Made It."** When the urea plant went on line, Waitzman says the moment came when an excited worker held up a sample bottle and said, "Urea! We made it!"

That won't happen with Ammonia from Coal.

There will be an opening ceremony with visiting dignitaries and then it will be business as usual.

That business will be important as OPEC oil prices increase. Coal gasification technology could provide one alternative to the nation's dependence on imported oil.



Muscle Shoals TVA Retirees put the welcome mat out for visiting Director Bob Clement. From left, Al Beinlich, John Shearon, Fred Wright, Association President E. C. French, Director Clement and TVA District Administrator B. I. Zellner.

## *It's A Celebration!*

*A special "celebration" to commemorate startup of the Ammonia from Coal plant is planned for 1:30 p.m. on October 8, the second day of the fertilizer technology demonstration.*

*Members of the Board, some members of the Congress, and several other officials are expected for the ceremony, which will be held at the plant site.*

*Also, OACD and IFDC employees are invited to tour projects being highlighted during the technology demonstration. Suggested hours for employee tours are 10:00 to 12:00 on October 7 and 1:30 to 3:30 on October 8.*