Ag and Food Interprets . . .

- **New promising agricultural uses for nitrofurans**
- **Lower accident frequency rate spurs interest in fertilizer safety**
- **Nearly 40% of farmers feel they should have used more fertilizer in '58**
- **Pesticide sales could hit $1 billion in 1975**
- **Good maintenance begins with equipment selection and record keeping**

Nitrofurans

New, promising agricultural uses for nitrofurans include animal disease treatment and prevention

THE LIST of agricultural uses for nitrofurans is getting longer. The class of compounds, which in little over a decade has become a standby in the treatment of livestock and poultry diseases (as well as in the treatment of some human ailments), is being aimed at:

- Improving egg production
- Treating bacterial enteritis and vibrionic dysentery in swine
- Preventing and treating paracolon infections in turkeys and chickens
- Preventing certain kinds of enteritis, pneumonia, and coccidiosis in rabbits.

Several other applications are still in the "could be" stage.

Nitrofuran compounds are made by Norwich Pharmacal and are distributed to agriculture exclusively by Hess & Clark, Ashland, Ohio. Synthetic antimicrobial drugs, they are bactericidal to many disease producing organisms —both primary and secondary invaders. The drugs are characterized by their method of germ killing action: shortcircuiting bacterial metabolic processes. A big plus is the drugs' relative nontoxicity to livestock and poultry.

The two most widely used members of the nitrofuran group are furazolidone and nitrofurazone. Specifically, furazolidone is used for the prevention and treatment of typhoid, paratyphoid, pullorum, and blackhead in chickens and turkeys. Its uses also include the maintenance of feed consumption, growth, and livability; and the chemical reduces morbidity in the presence of some nonspecific diseases and disease complexes for which there is no treatment today.

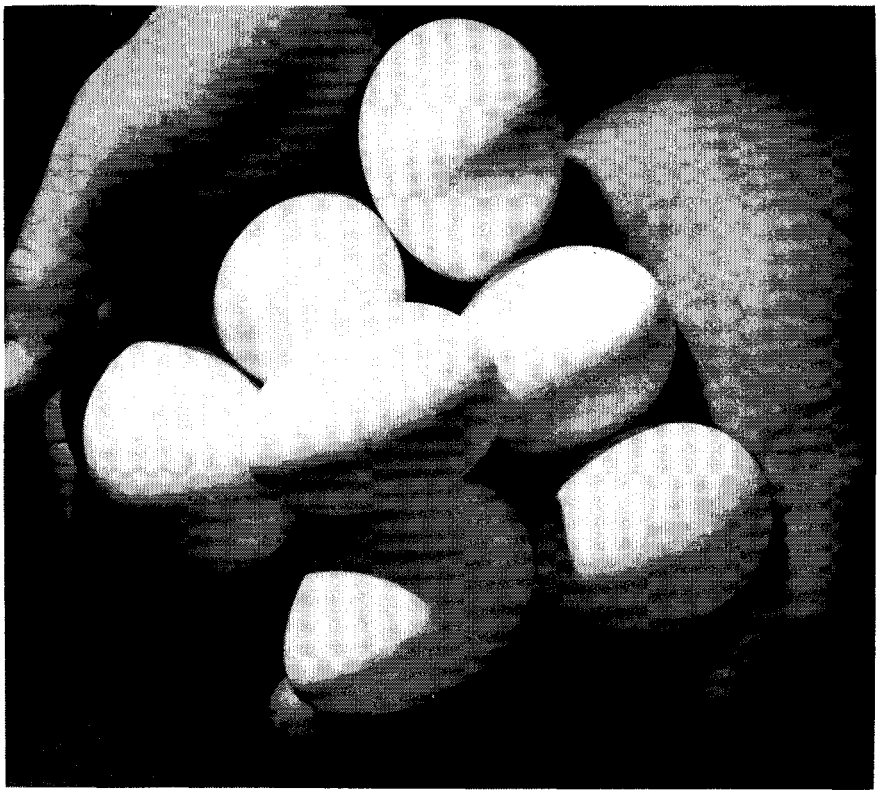
Studies under way on use of nitrofurans include treating coccidiosis, one of the most common parasitic diseases in domestic rabbits. These animals are part of the group at Norwich Pharmacal's labs

Nitrofurazone is used to prevent and control cecal and intestinal coccidiosis in chickens, and aids in controlling losses from secondary infections that occur with outbreaks of coccidiosis.

Norwich synthesizes nitrofurazone by the reaction of 5-nitro-2-furaldehyde diacetate (made from furfural) with semicarbazide. Making furazolidone calls for treating the same nitro derivative with 3-amino-2-oxazolidone. Hess & Clark formulates and distributes the compounds in different forms and concentrations, which are determined by the condition being treated.

New Uses Could Double Volume

If the many possibilities now under study should come through, nitrofuran sales volume would double, says Hess & Clark. Of the new uses for furazolidone, one—as a treatment for enteritis and vibrionic dystentery—has already been cleared by the Food & Drug Administration. Results include some reductions in death loss and in the number of pigs whose growth is stunted by the disease. With fowl, furazolidone treatment has been found to cut mortality due to paracolon dis-



Low-level furazolidone feeding results in seven more eggs per hen in 300 days

ease by 50%. And the drug seems to have a preventive effect if fed prior to birds' exposure to the ailment. Also, experiments indicate that the growth rate of infected but furazolidone-medicated birds is somewhat better than that of untreated ones. And treating rabbits with furazolidone improves weaning percentage and weight gains in young animals, along with controlling and preventing diseases.

Improving Egg Production

An especially intriguing application of furazolidone is in improving egg production. According to Hess & Clark's Paul D. Harwood, continuous low-level feeding of the compound to laying hens not only increases actual egg production, but also improves the feed-to-egg ratio, and improves hatchability, livability, and fertility. Improved production during early and late egg laying periods, maintenance of greater egg laying performance even under stress, and increased production during abnormally low performance periods are additional benefits.

Economics of treatment in relation to egg laying improvement are dramatic, reports one researcher. A dime's worth of the drug could give an egg producer a return of about 17 cents in extra eggs per hen. Feed savings alone would account for about 13 cents more per hen. Generally, says Hess & Clark, ten cents' worth of the drug would return at least 30 cents to the poultry man—a profit over drug costs of 20 cents or more per hen.

Not so far along, but promising, is research in several other areas. University of Arkansas finds a potential for nutritional application of some new nitrofurans. These are not on the market yet, but some definite growth response has been obtained with them. A growth response was also observed at Michigan State University, especially when the nitrofuran (furazolidone in this instance) was used in combination with penicillin and/or 3-nitro-4-hydroxy phenylarsonic acid.

Still other studies are being made on shipping fever, mastitis of dairy cows, sinusitis of turkeys, erysipelas of swine and turkeys, worms in all livestock, and enteritis in calves.

Prevention Is Emphasized

Although the nitrofurans have wide applicability in treatment of livestock and fowl diseases, major research emphasis is on disease prevention. According to Hess & Clark, furazolidone already prevents more poultry diseases than any other known agent. Another research emphasis: the extent of nitrofurans' contribution to over-all feed efficiency.

Safety in Fertilizer Plants

Interest in safety gains rapidly as industry aims for improved accident frequency records

SAFETY IS EVERYONE'S BUSINESS, as the slogan goes. In the fertilizer industry and particularly in the manufacturing side of the industry, safety seems to be getting added notice. Cause: the industry's relatively poor accident frequency record as compared with records of other industrial groups. In 1957, according to National Safety Council figures, fertilizer industry members reporting to the council had 8.27 disabling injuries per million man hours exposed, compared, for example, with the chemical process industries which had a rate of 3.55, or high explosives with a 1.34.

The fertilizer industry looks bad on the basis of figures alone. Why? Several reasons are cited by members of the industry and by safety people. One is that many companies do not avail themselves of the assistance offered by such groups as the National Safety Council. As it has for many other industry groups, the NSC has an extensive safety program designed to improve safety in fertilizer manufacture. But roughly three fourths of the companies that make fertilizers are not members of the NSC fertilizer section.

For those that have participated in the NSC program, the frequency dropped from 15.0 in 1950 to 10.8 in 1956. And in 1957 some 175 plants of fertilizer manufacturers which entered a NSC fertilizer section safety contest recorded a drop of 43% in accident frequency for the year. For the more than 600 plants that did not enter, the record is indefinite, but certainly less satisfactory as judged from insurance premium figures.

Diverse Operations Hurt Record

Another reason is the varying records of the several segments of the industry. The fertilizer industry covers to some degree chemical manufacturing, mining, minerals beneficiation, mixing of liquid or dry materials, granulation processes, distribution of bulk materials, and other operations. Some segments have significantly better accident frequency records than the industry as a whole; others worse records.

Fertilizers won't cake—flow freely in the field

Many a farmer has been cursed by the serious caking problem which so often occurs when deliquescent fertilizers are stored in damp or humid conditions. And many a formulator has learned that this can easily be prevented by using Celite*. These tiny particles of diatomite surround the fertilizer crystals or prills with a protective coating that can prevent contact between them and thus minimize caking.

At the same time Celite fillers improve flowability. The particles are not only microscopic in size but extremely irregular in shape. This Celite coated fertilizers flow more freely. As little as 2% of Celite assures more uniform application in the field.

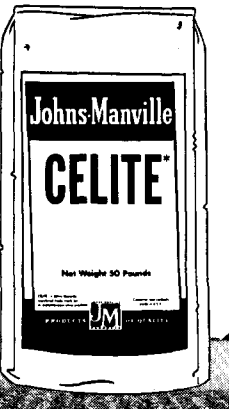
A Celite engineer will gladly help you put the right grade to work in your fertilizer. Just phone him at your nearest Johns-Manville sales office or write Johns-Manville, Box 14, New York 16, New York. In Canada, address 565 Lakeshore Road East, Port Credit, Ontario.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products

when formulated with

CELITE

diatomite fillers



JOHNS-MANVILLE JM PRODUCTS

Johns-Manville CELITE INDUSTRY'S MOST VERSATILE MINERAL FILLER

Materials handling has received the most attention in fertilizer safety circles during the past 20 years

A third factor in the industry's safety record, and one which receives more and more attention, is the attitude toward safety. According to Paul T. Truitt of the National Plant Food Institute, there has long been a rather widespread feeling that the fertilizer industry will always show a relatively high accident frequency rate when compared with other industries, because of hazards inherent in the business. Yet, says Truitt, the experience of the NSC's fertilizer section shows this view is unsound. An active management attitude, with improved time and money budgets for safety programs, suggests Truitt, is the key to progress that will return money to the fertilizer industry.

Public bodies responsible for industrial safety tend to consider the fertilizer industry over-all as somewhat hazardous. Similarly, insurance companies are inclined to blanket all fertilizer industry operations in a more restrictive classification than many in the industry think is justified. Both of these views result from past unfavorable safety experience by various segments of the industry.

The desire to change these views—which in general are unjustified, say those who make fertilizer and its raw materials—is bringing about redoubled efforts to build better safety records. Besides manufacturers, insurance companies, NSC, and NPFI, other organizations which have hard-working safety committees or groups include the Manufacturing Chemists' Association, the Anhydrous Ammonia Institute, the Compressed Gas Association, and the American Standards Association.

What's Being Done

Safety programs naturally vary with the organization behind the program, the type of fertilizer involved, and the individual company. Organizational programs aim at educating exposed individuals, although they partly over-lap into enforcement efforts.

Educational programs for fertilizer manufacture and handling are generally similar to those for all industry. Their specifics cover such things as how to handle anhydrous ammonia, sulfuric and phosphoric acids, solutions; how to use protective clothing and equipment needed when handling fertilizer ingredients; and how to operate specific items of production equipment such as ammoniators or granulators.

Coupled with attempts to improve attitudes toward safety are efforts to enforce safe practices once they have been established. Enforcement sections of programs include ensuring use of safety equipment where needed, and periodic, although not necessarily regular, safety inspections. (Experts suggest following the process flow of manufacturing operations to assure efficient inspections.) A thorough and prompt investigation of any major accident or significant "near miss," including a report with recommendations, constitutes the third important phase of enforcement of safe practices.

Technology Helps

Technological assists toward safer working conditions are many and varied. These range from engineering and design refinements to new processing techniques. Materials handling is perhaps the field which has received most attention over the past 20 years. However, lifting injuries still rank high, and bring continued efforts to educate workers in the how, what, and when of lifting. Such injuries also lead to increased investment in equipment to reduce human labor.

Ammoniators used in making fertilizers provide one example of a processing unit that has received attention in the recent past; they now are being continually redesigned to operate with minimum fire hazard. Fires in ammoniators stem from improper distribution of materials, which in turn is caused by poor design, lack of maintenance, corrosion, or poor operating technique. Safety improves as each of these factors is modified; easier maintenance, corrosion resistant alloys, greater operating experience all go into improved design.

Other examples of technological progress toward safer fertilizer manufacture are plentiful. The industry's hazards, while never to be discounted, are no more serious, and are generally less serious, than those faced in pesticides manufacture or in other parts of the chemical industry. But pesticides makers take safety more seriously (AG AND FOOD, May, page 335). Safety men say the fertilizer industry could sharply improve its accident record if its members developed the safety attitudes, and expended the efforts prevalent in the pesticides industry.

Farmers' Attitude to Fertilizers

Nearly 40% feel they should have used more fertilizer this year. But over half are satisfied their fertilizer use was adequate

NEARLY 40% of the nation's commercial farmers feel they should have used more fertilizer last year than they did, and only 3.5% feel they should have used less fertilizer. Those satisfied that they used the right amount in 1958 comprised 51.2% of the total.

Straight facts from the field

that single out the ideal triple selection

. . . just as the soil test is the basic factor in finalizing ingredient selection, so also does International look to the basic experience and judgment of people in the field to help chart new courses in phosphate products . . . and for direction that improves primary fertilizer performance and develops superior finished goods.

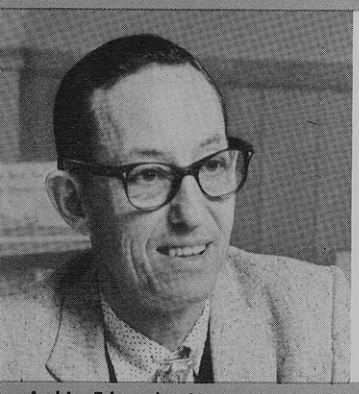
These manufacturers report
THE FIELD FACTS

M. K. Miller, *President*, Green Belt Chemical Co., St. Paris, Ohio — Bryant, Indiana

"We grew up with International Triple Super. Right from the start International worked with us to smooth out production and reduce costs."

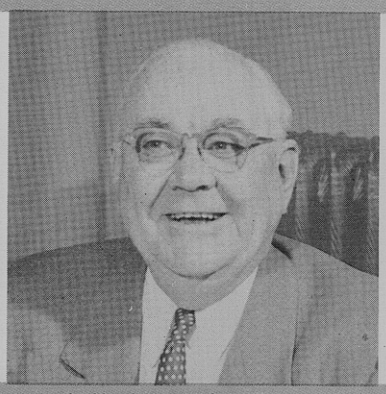
Mrs. Grace Koos Anderson, *President*, N. S. Koos & Son, Kenosha, Wisconsin

"In the many years we have used International, they never let us down."



Archie Edwards, *Manager*, Red Star Fertilizer Division, Sulphur Springs, Texas

"Service is a mighty big reason we contract for International's Triple."

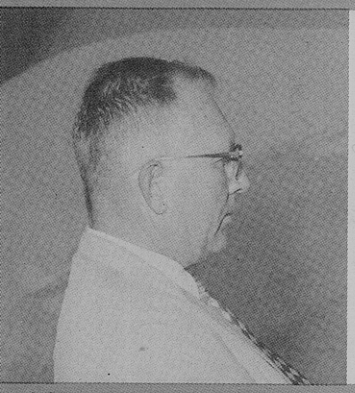


A. C. Norris, *President*, V. W. Norris & Son, Inc., Rushville, Indiana

"We like International's Triple and the way they do business."

George H. Alber, *President*, Marion Plant Life Fertilizer Co., Marion, Ohio

"We like the way it ammoniates . . . and the granulated product we get. It's high-grade phosphate, costs less per unit."

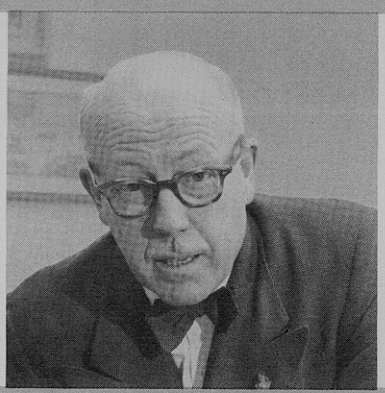


J. Raymond Myers, *Production Mgr.*, Fertilizer Dept., Eastern States Farmers' Exchange, York, Pa.

"International has proved that barge shipments (by Allegheny) are practical. Shipments of Triple Super bring immediate savings in shipping costs."

Damon Robinson, *Manager*, Plant Food Division, Kelly-Weber & Company, Inc., Lake Charles, La.

"International's charter carports of Triple help us use our water life-line to best advantage."



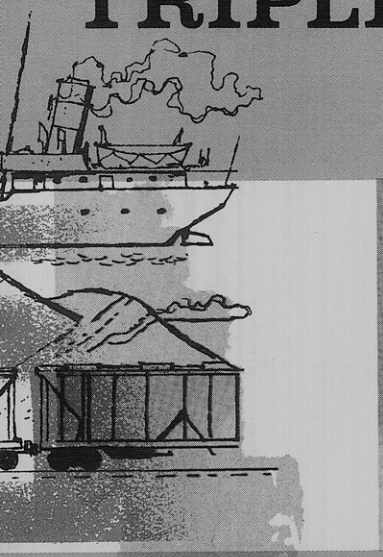
Alex Mooney, *General Manager*, Fertilizer Division, Canada Packers, Ltd., Toronto, Canada

"Our first shipment of Triple worked fine . . . so have the rest. We're sold on ocean and lake-going vessel shipments. Comes through in fine condition."

A. H. Roffers, *Gen. Mgr.* (left), and W. E. Jones, *Mgr.*, Fertilizer Div., Northwest Co-op Mills, Inc., St. Paul, Minnesota

"Even after months of storage, your Triple crumbles like a cookie."

ON INTERNATIONAL'S TRIPLE SUPERPHOSPHATE...

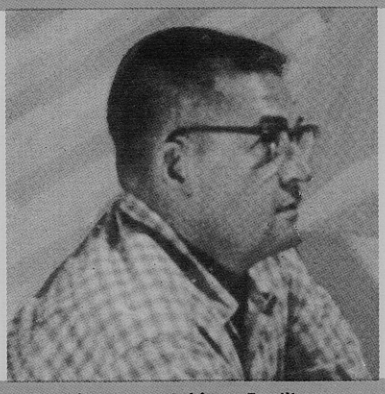


E. D. Kingsbury,
Kingsbury & Company, Inc.,
Indianapolis, Ind.

"We like the way International emphasizes research, develops new products, pioneers new approaches to shipping and technical service."

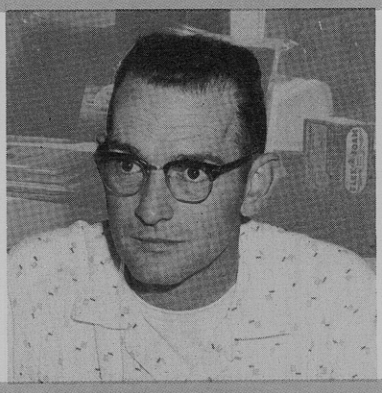
E. W. Liggett, *General Manager,*
Bartlett and O'Bryan Fertilizer Co.,
Owensboro, Ky.

"Good product . . . good service . . . good people — that's the reason I buy Triple Super from International."



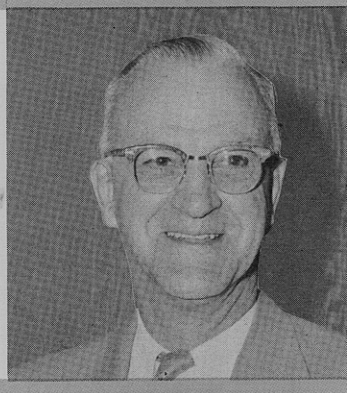
Don Peterson, Ashkum Fertilizer Company, Ashkum, Ill.

"International's Triple Super has earned its place in our plant. We can bank on its arriving in good physical condition for easy handling. We like the way the triple ammoniates."



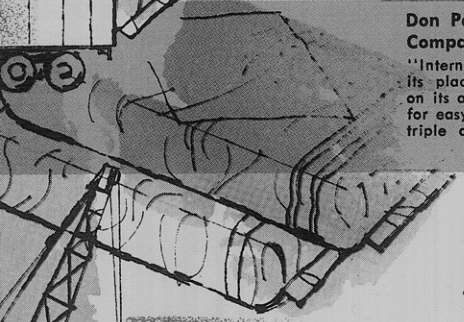
A. B. Chrisman, *President,*
A. B. Chrisman Fertilizer Company,
Meredosia, Ill.

"I like the Full Orbit program. It's already helped us solve some business problems — it's full of ideas and suggestions that we're putting to good use."

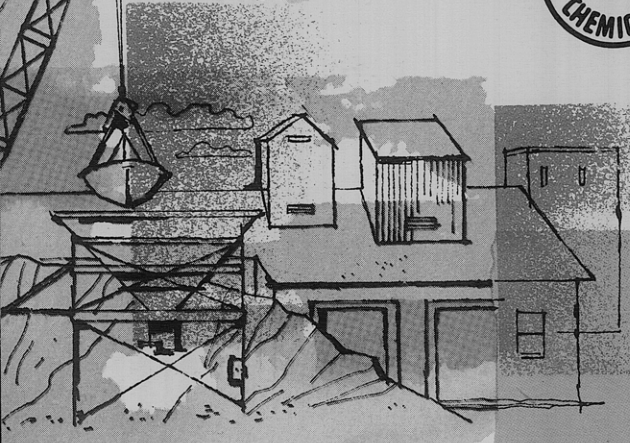


A. R. Mullin, *Gen. Mgr.*, Fertilizer Div. Indiana Farm Bureau Co-op Assn., Indianapolis, Ind.

"International's Triple hits a consisten high in product quality and service."

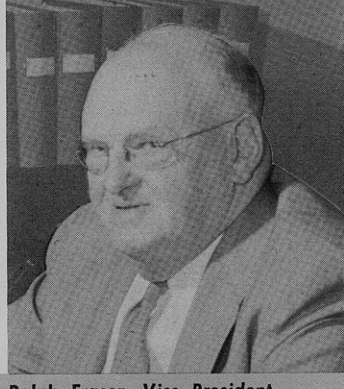


MINERALS International CHEMICALS



W. R. Edgecomb, *Treas.-Gen. Mgr.*,
Aroostook Hi-Test Fertilizer Company, Presque Isle, Maine

"We learned by experience; our ammoniation rate proved that International's Triple had superior ammoniation qualities we were looking for."



Ralph Fraser, *Vice President,*
Summers Fertilizer Company,
Baltimore, Md.

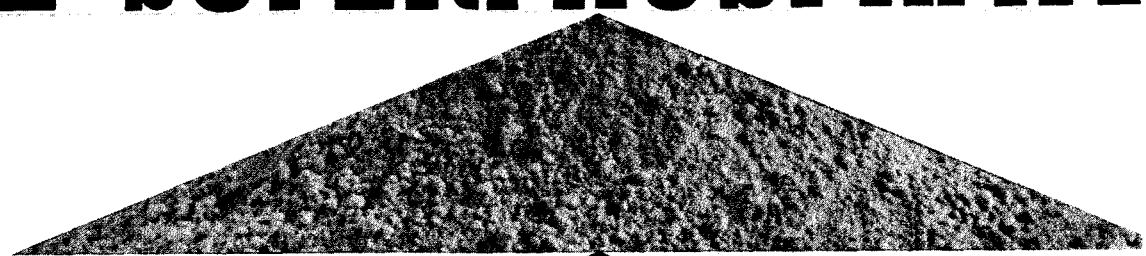
"Pushing barge shipments up the Mississippi has meant immediate savings at our inland plants."

from International's Triple Super Service
and proved dependable products

TRIPLE SUPERPHOSPHATE

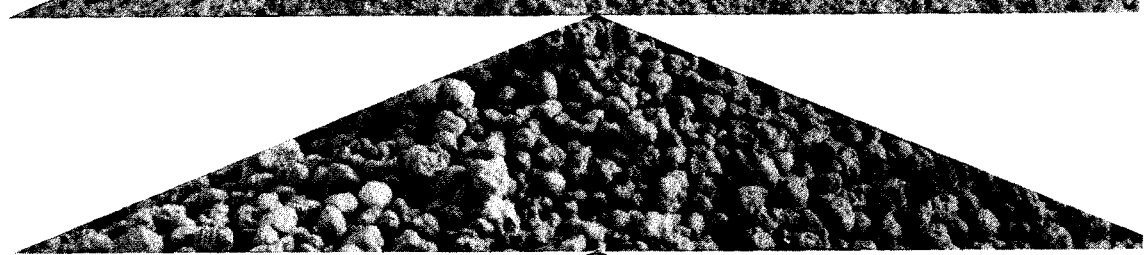
RUN OF PILE

International's fine-textured Triple provides uniform particle size, even density and proper moisture level that lets you ammoniate at higher rates, temperatures.



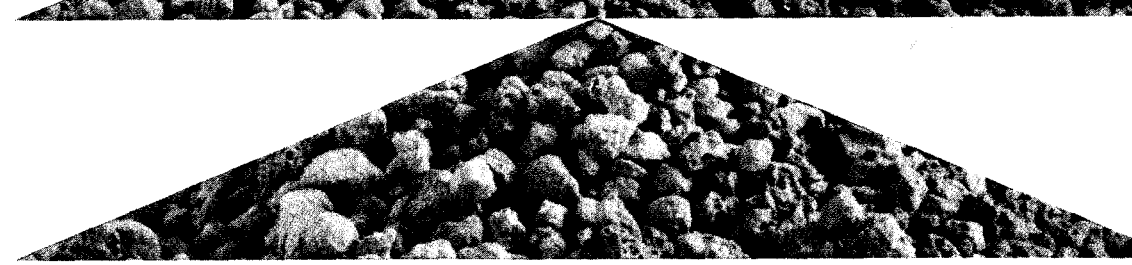
COARSE

International's coarse-textured Triple gives same excellent ammoniation batch after batch . . . promotes desirable agglomeration.



GRANULAR

International's new granular Triple is non-crumbling, free-flowing; makes granulation easier. Sponge-like structure of granules facilitates ammoniation.



INTERNATIONAL'S PHOSPHORIC ACID

Now you can make International your dependable single source of all high-analysis phosphate ingredients. International's high purity 53%-55% phosphoric acid comes direct to you in rubber-lined tank cars, shipped to meet your tightest schedules.

Creators of Living Minerals

MINERALS International CHEMICALS

PHOSPHATE CHEMICALS DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois

Those statements are based on a recent survey of Doane Agricultural Service's countrywide farm panel. It is composed of 1900 farmers who form a representative sample of all commercial farmers with annual incomes of over $2500. Of those 1900 farmers, 1691 returned usable replies to Doane's questionnaire. The questionnaire was aimed at finding out about farmers' attitudes toward the value of fertilizer, brand preference, and factors that influence fertilizer purchases.

Bagged fertilizer was used by 1343 farmers (81.3%); only 136 (8.2%) used bulk or liquid fertilizers. Of the farmers who used bagged products, an average of 1.85 brands per farmer had been purchased at the time of the survey (September).

A measure of the relative popularity between brands (or manufacturers' names) and between co-op and private brands was obtained. The 1343 farmers who used bagged fertilizer reported 2489 different brand purchases. Of these 2489, 577 (23.3%) were manufactured and/or distributed by co-ops. Two co-ops stood well above the others in frequency of purchase.

Co-op Brand or Name	Percentage of Farmers That Purchased the Brand
Co-op A	32.2
Co-op B	12.9
Co-op C	6.9
Co-op D	6.6
Co-op E	5.7
Co-op F	5.5
Co-op G	2.9
Co-op H	2.4
All other co-ops	15.9
Specific co-op not mentioned	9.0

Products of private industry accounted for 76.7% of the brand purchases. These purchases, however, were much more evenly proportioned among the various distributors than was the case with the co-ops. The tabulation of the most frequently mentioned producers is listed below.

Company Brand or Name	Percentage of Farmers Using the Brand
Company A	7.3
Company B	6.7
Company C	6.1
Company D	5.4
Company E	5.0
Company F	5.0
Company G	4.4
Company H	3.7
Company I	3.6
companies	52.8
All other private	

There were 89 purchases of bagged fertilizer which could not be identified either by brand, company, or type of manufacturer.

A regional comparison reveals there was little or no significant difference in number of different brands purchased as between regions; however, there was a difference in bagged *vs.* bulk and liquid in the various regions, with the West North Central, East North Central, and Western regions showing a greater percentage of farmers using only liquid or bulk fertilizer. The percentages for these regions are 13.4, 9.8, and 6.6 respectively (see Table I).

There was also a wide difference in fertilizer *vs.* no fertilizer by region. In the West North Central region almost 18% of the farmers used no commercial fertilizer, and in the Western region this figure was over 20%. At the other extreme, less than 1% of the farmers in the South Atlantic region used no commercial fertilizer (see Table I).

Farmers were asked why they used the analyses they did and why they used the amounts they did. Appar-

Table I. Brand and Type of Fertilizer Purchases by Region

Number of Brands Purchased	N.A. %	S.A. %	E.N.C. %	S.C. %	W.N.C. %	Western %
1	48.4	30.8	43.3	32.3	31.1	33.6
2	34.9	33.0	27.7	33.0	25.5	24.3
3	10.3	20.0	9.6	8.4	8.4	11.8
4	2.4	8.1	3.4	5.7	1.9	2.6
5	0	3.2	0.8	2.4	1.6	0.7
Used liquid or bulk only	1.6	2.7	9.8	4.0	13.4	6.6
No commercial fertilizer used	2.4	0.5	5.1	6.7	17.9	20.4
No answer	0	1.6	0.3	1.0	0.2	0

Table II. Factors That Influenced Analysis Purchased

	No. of Responses	%[a]
Soil tests, maintain fertility	1037	62.8
County agents, experiment stations, state universities	658	39.8
Personal experience	274	16.6
Dealer and/or mfr. salesman	263	15.9
Magazines, newspapers, radio, etc.	94	5.7
Neighbor and/or landlord	51	3.1
Price, more plant food at less cost	33	2.0
Other	64	3.9
No answer	305	18.5
	2474	

[a] Total exceeds 100.0% because of multiple answers.

Table III. Factors That Influenced Amount Purchased

	No. of Responses	%[a]
Soil tests, maintain fertility	985	59.7
County agents, experiment stations, state universities	643	38.9
Amount that could be purchased with money budgeted for fertilizer	292	17.7
Personal experience	119	7.2
Dealer and/or manufacturer's salesman	110	6.7
Neighbor and/or landlord	54	3.3
Government payments	7	0.4
Other	24	1.5
No answer	246	14.9
	2234	

[a] Total exceeds 100.0% because of multiple answers.

ently, there are several important "spheres of influence" in deciding these questions, since there was an average of almost two responses per farmer to each question. The two major sources of outside influence were: (1) soil tests, and (2) county agents, experiment stations, and state universities. Soil tests appeared to have a slightly greater influence in determining analysis than in determining the amount of fertilizer used. The influence of county agents, state universities, and experiment stations was about equal in each.

Magazines, radio, and other mass media appeared to help the farmer much more in deciding the analysis to use than the amount to use. Likewise, personal experience of the farmer had a much greater influence on the decision of analysis than of amount. Dealers and manufacturers' salesmen were also much more influential in determining analysis than amount of fertilizer.

There were other reasons listed which cannot be compared between analysis and amount (see Tables II and III).

The answers to the questions on analysis and amount of fertilizer revealed that some of the panel members have contractual arrangements with vegetable canning plants. In these cases, it appeared that a representative of the canning plant was the most important of all factors in determining analysis and amount of fertilizer.

Doane reveals that it will make a similar survey next July, but that it will then emphasize tonnage data and buying intentions for the following year.

Pesticide Industry Progress

Sales could quadruple by 1975, if the industry learns from past mistakes

At least $1 billion by 1975. That's one expert's prediction for future annual sales of pesticides at the manufacturer's level. The expert: Jackson V. Vernon of Food Machinery & Chemical, president of the National Agricultural Chemicals Association. Occasion for Vernon's optimistic pronouncement was NAC's 25th Anniversary meeting, held at Savannah, Ga., October 29-31.

There are some "ifs" attached to the prediction, of course. And some of them are formidable. Vernon expects 1975 sales to top $1 billion—roughly quadrupling sales of about $265 million in recent years—

- If inventory control and credit management are improved enough to make reasonable profit margins and returns on investment possible;
- If research is not merely maintained but pushed more vigorously;
- If knowledge of new and improved products is passed along swiftly and freely to the customer;
- If changes are made in products, distribution methods, and customer service, to keep abreast of changes in farmers' methods and needs;
- If individuals, companies, and groups such as NAC intensify efforts to promote safe use of pesticides, and to combat—with truth—unfavorable publicity and unwarranted attacks on the industry or its products.

Rising population and shrinking farm acreage and manpower have made the pesticides industry essential, Vernon observes. But essentiality is no guarantee of adequate profits and economic stability in the pesticides industry. Future progress, he says, will depend on the extent to which pesticides producers learn from the past.

Pesticides sales could reach $1 billion by 1975, but there are many "ifs" attached to that prediction

Confusion from Chaos

There is evidence that they have learned some lessons in recent years, but they still have far to go. The progress that has been made toward correcting the industry's unsound business policies and practices was characterized by John L. Gillis of Monsanto as an advancement from "chaos" to "confusion." Comparing present pesticide business practices with those that prevailed when he previously "analyzed" the industry at the 1955 NAC meeting, Gillis concluded that the industry has been learning fast—the hard way—that it is engaged in a serious and professional activity with no room for amateurs, irresponsible entrepreneurs, and "fast buck" artists.

The herbicides segment of the industry in particular, says Gillis, has made real headway in its efforts to eliminate consignment selling, inventory laxity, excessive credit, and other poor selling practices. Unfortunately, though, the improvements which have been made in marketing of herbicides have not been matched in the insecticides field. Channels of insecticide distribution appear to be still as chaotic as they were in 1955.

In herbicides, consignment selling has been replaced in considerable measure by sales for cash—with the encouragement of such devices as a 5% discount to the distributor for cash. (Recent experience of Monsanto, for instance, indicates that 80% of invoices for formulated herbicides have been paid within 30 days, and another 10% within 60 days.) Formulators of herbicides have made another forward step, according to Gillis, by instituting fair-traded prices.

In insecticides, on the other hand, not only sales to dealers and distributors, but even sales of technical material to formulators still are commonly on a consignment basis. There are no fair-traded prices. Price cutting, still widespread, is a serious drain on profits from insecticides manufacture.

On the whole, however, the pesticides industry is becoming increasingly reputable, and the prognosis is no longer negative. The profit anemia which persisted until about 1955—probably the turning point—has been overcome to some extent as other ills afflicting the industry have been partially healed.

Reasonable profits are a must, since they provide the financing of the future. Careless business procedures resulting in losses or unsatisfactory

profits, says Gillis, hardly encourage a board of directors to invest millions of dollars in long-range research—and without that research this industry would die. Up to now, much of the industry's research effort has been made, in effect, on borrowed time as well as borrowed money. It has been supported on faith by management that the industry can and will right itself and earn its own way.

But unless further progress is achieved in overcoming the questionable business practices that remain, the prediction of $1 billion in sales for 1975 could prove merely a pleasant illusion.

Preventive Maintenance

Sound maintenance policy begins with selection of equipment, demands good record keeping

How can fertilizer producers strike an economic balance between maintenance costs and charges for equipment replacement? How does the plant manager fix the interval between shutdowns for preventive maintenance overhauls to minimize total maintenance costs? What activities are included in a good preventive maintenance program?

These are some of the questions this year's Fertilizer Round Table sought to answer. Major subject areas covered in the three-day (Nov. 5–7) meeting in Washington, D. C., included the economics not only of preventive maintenance, but also of processing and of formulation.

Participants agreed that good preventive maintenance—maintenance performed before it is absolutely necessary—requires attention to scheduling. It cannot be achieved with maximum economy unless sufficiently informative performance records are kept for each equipment item. But it begins even before the equipment is installed. As Robert E. Robinson of Atlanta Utility Works explained, sound maintenance policy begins with the selection or design of equipment.

A motor installed for severe or constant duty on a 24-hour, year-around basis, for example, should be considerably more rugged than one needed only for stand-by or light duty on a part-time basis. Intelligent investment in equipment, from the preventive maintenance viewpoint, must take into account the type of duty the equipment will handle.

The objectives of preventive maintenance are prevention of breakdowns, prevention of unnecessary wear or damage to equipment, attainment of maximum economic useful life, preservation of safety, and attainment of lowest possible total operating cost. These objectives are achieved through general good housekeeping in the plant, and such specific activities as regular cleaning and visual inspection, followed by proper lubrication. These are the simplest steps. Next come slightly more involved jobs, such as simple adjustments, partial disassembly, and testing the accuracy of measurements.

Also scheduled and carried out systematically are painting and replacement of packings and normally wearing items. Replacement of heavier parts and major adjustments should also be anticipated, and scheduled for regular down-time periods. Complete overhaul is least frequent of preventive maintenance chores, but it is sometimes preferable to a series of piecemeal emergency repairs during unscheduled breakdowns.

The added expense of good preventive maintenance, Robinson stressed, requires economic justification just as would any other investment. This requires continued study based on the best records and estimates available. The study must extend beyond simple maintenance costs to yield comparisons of total operating costs.

This is the point at which good records become important. The more complete a plant's records on costs for original investment, repairs, routine maintenance, and actual operation, the easier it becomes to decide between available courses of action. Even when a situation looks hopeless from lack of data, careful study of any information that can be obtained offers greater assurance of reaching the correct economic solution than would a completely blind guess. And as a continuing program is developed, many seemingly inaccessible items of data come to light.

A simple card file was recommended to Round Table participants to log maintenance records; study of such cards readily reveals such errors as undergreasing or overgreasing, and may even reveal that an item is overdesigned or underdesigned for its job.

While records should be designed to provide as much useful information as possible, they should also be kept as simple as possible. For if record keeping becomes too complicated or difficult, it may be neglected or even totally abandoned.

On production equipment, records should indicate the total tonnage of fertilizer processed between installation and failure or replacement. As data are accumulated, it becomes possible to predict—from tonnage production figures—when trouble is about due. As that time approaches, frequency of inspection should be stepped up to make certain that an actual breakdown does not occur.

Ideally, all preventive maintenance should be handled during normal plant shutdowns, in off-season months. In practice, this cannot be done. A certain amount of daily maintenance is required whenever the plant is operating, and occasionally it becomes necessary to halt production even during the busy season to allow a preventive maintenance overhaul. Again record keeping becomes important, since it enables a plant manager to pick the most economical interval between maintenance shutdowns.

If records are properly kept, the interval can be chosen through a graphical procedure outlined by Jesse C. Jessen of Du Pont. In this procedure, two curves are plotted on a single graph. The first—usually a straight line—shows the gradual increase in daily maintenance costs as the number of operating hours between shutdowns grows larger. The second is a curve showing the apportioned cost of the maintenance shutdown itself. This curve drops sharply at first, but levels off to become nearly flat as the overhaul interval becomes very large. When these two curves are added, the result is a parabolic curve which passes through a minimum. The point at which this third curve begins to reascend after passing through its minimum indicates the number of hours that the plant should be operated between maintenance shutdowns. This point marks the most economical balance between daily maintenance costs and preventive maintenance overhaul charges.

An important adjunct to a good preventive maintenance program is the ready availability of replacement parts. Albert Spillman of Fertilizer Manufacturing Co-op stated that his company's Baltimore plant, representing an original investment of about $500,000, keeps a stock of spare parts worth about $30,000. While the plant's operators would prefer never to use the spares, they represent excellent insurance against serious maintenance delays. Some fertilizer companies, Spillman said, keep stocks of spare supplies and parts representing as much as 8 to 10% of the original equipment investment.