Enclosure 1

215 Natural Resources Building

APR 2 1981

Mr. J. P. Martin
Alabama Water Improvement Commission
Public Health Services Building
Montgomery, Alabama 36130

Dear Mr. Martin:

TVA BELLEFONTE NUCLEAR PLANT (BLNP) - USE OF COHEREX DUST RETARDANT

In reference to your recent telephone conversations with D. S. Walsh of the TVA Water Quality Branch, TVA proposes to use a chemical stabilization agent named "Coherex" to control fugitive dust on dirt and gravel roads at BLNP. Enclosure 1 contains the manufacturer's literature for the product which is an emulsion of petroleum oils and resins. Recommended dilutions and application rates are reflected in the literature.

As you are aware, on December 18 and 19, 1980, a test was conducted at BLNP in an attempt to determine if significant quantities of "Coherex" might be washed from affected roads during heavy rainfall events and subsequently impact surrounding surface waters. On December 18 a 1:4 dilution of "Coherex" (manufacturer's recommended dilution) was applied to a test section of road. On December 19 raw river water was repeatedly spread over the affected road surface to simulate a heavy rainfall occurrence. The majority of the runoff was collected in a drainage ditch adjacent to the roadway and subsequently conveyed to the East Culvert Impoundment (NPDES Discharge Serial Number 004). Enclosure 2 is a location map which shows the test area and various sampling locations. The following water samples were collected and analyzed for selected water quality parameters:

1. Control sample from yard drainage in ditch upstream of test site.

2. Runoff sample at edge of road prior to entering drainage ditch.

3. Runoff sample after mixing with yard drainage in ditch downstream of test site.

Enclosure 3 is a tabulation of pertinent water quality data used to evaluate Coherex including the analytical test results. A comparison of the data for parameters listed as present in the 1:4 dilution of Coherex (which was applied) to raw river water data, tentative effluent limitations (and other acceptable standards), and instream water quality criteria shows that Coherex should have no significant impact on surface water quality with respect to these parameters. The data from test sample location No. 2 (edge of road prior to entering drainage ditch) show that concentrations of Mg, K, Fe, Zn, and Pb were relatively high when compared to the 1:4 dilution of Coherex. However, it is believed that these values can be attributed to either soil constituents which make up the road surface ~~(e.g., Fe)~~ or materials which accumulate on the roads

Mr. J. P. Martin APR 2 1981

and are normally washed off during heavy rainfall events (e.g., Pb). Data for COD, TOC, and oil and grease concentrations present in Coherex were not available from the manufacturer. Based upon test results obtained at location Nos. 2 and 3, COD is the only one of these parameters of concern (300 mg/l prior to entering East Culvert Impoundment). Since the volume of dilution water available during an actual rainfall event would be much greater than that available during the test, we feel that COD will probably have an insignificant impact on surface water quality. To substantiate this (if approval to use Coherex is granted) we will, at your request, monitor COD at the discharge of the East Culvert Impoundment and the Construction Holding Pond (NPDES Discharge Serial Number 002) during 5 or 6 selected heavy rainfall events for a trial period not to exceed six months after initiating project wide use of Coherex. After this time we would submit the rainfall data to you for your evaluation.

Based upon the results of the above assessment we ask your expeditious review and approval of our request to use Coherex at BLNP. We feel that the use of a chemical stabilization agent to control fugitive dust shows great promise in filling our current needs. We will be happy to work directly with you to alleviate any concerns or problems which you might have concerning this proposal. Please contact G. R. Steiner at 615/755-3173 in Chattanooga, Tennessee with any questions.

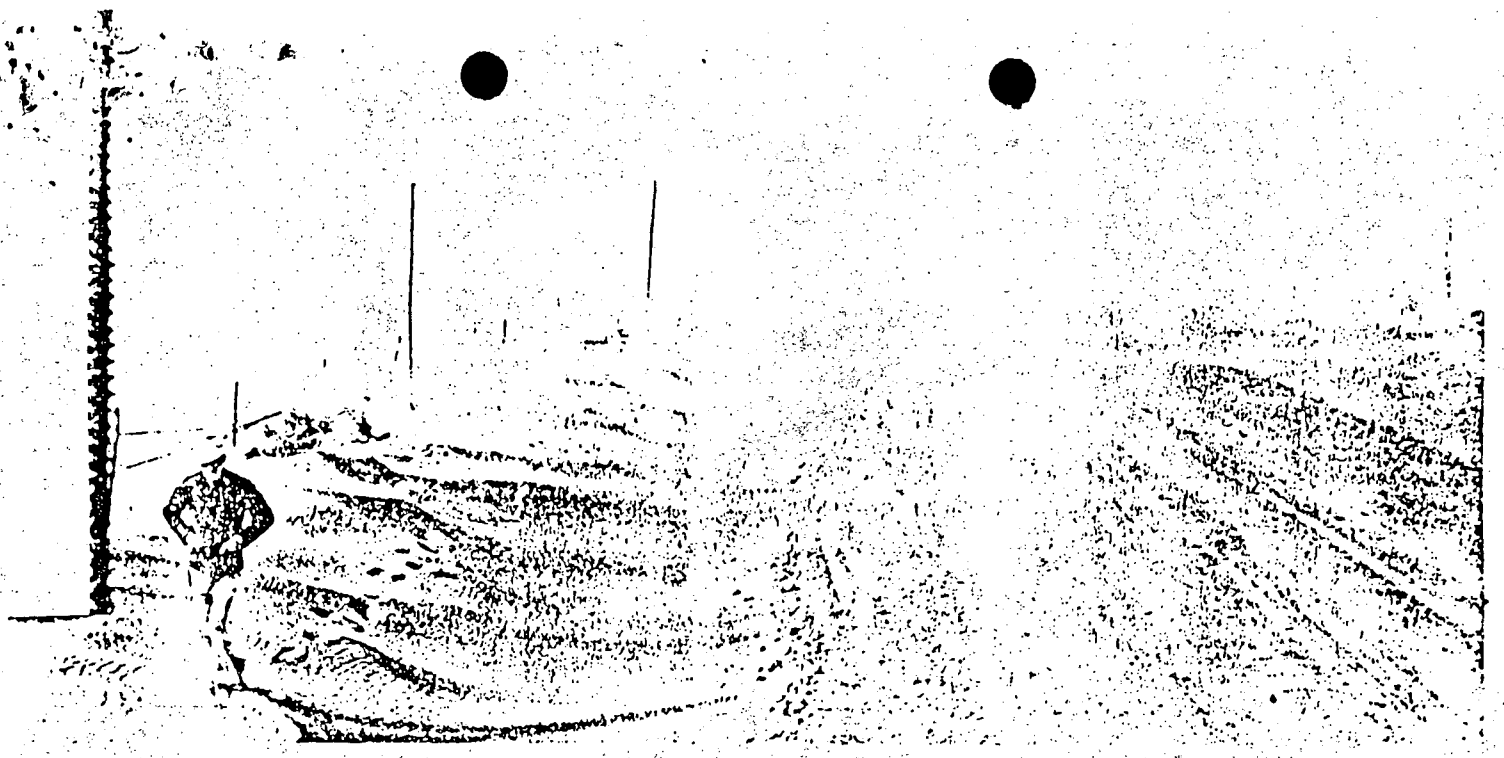
Sincerely,

Original Signed By
M. T. El-Ashry

Mohamed T. El-Ashry, Ph.D.
Director of Environmental Quality

DSW:DJC
Enclosures

ENCLOSURE 1



COHEREX DUST RETARDANT SOLVES the PROBLEMS of DUST

WHAT IS *COHEREX*?

COHEREX dust retardant is an effective dust control agent developed by the Golden Bear Division of Witco Chemical Corporation. It has a proven history of dust control, having been in use since 1949.

It is a stable, concentrated, non-volatile emulsion consisting of approximately 60 per cent petroleum resins and 40 per cent wetting solution. The resins are the film-forming, dust-binding portion. The wetting solution keeps the petroleum resins dispersed in finely divided particles and makes *COHEREX* dust retardant readily miscible with water – even sea water. The wetting solution also facilitiates penetration of the resinous particles and increases the spreading power of the diluted emulsion.

When diluted *COHEREX* dust retardant is applied by conventional spreader equipment, it coats the dust particles and forms cohesive membranes that bond adjacent particles. The chain-like bonds result in large agglomerates. The upper layer of the soil itself becomes a cohesive cover that is difficult to move by wind or moving objects. Dust particles susceptible to air suspension are eliminated by agglomeration into larger, cohesive particles.

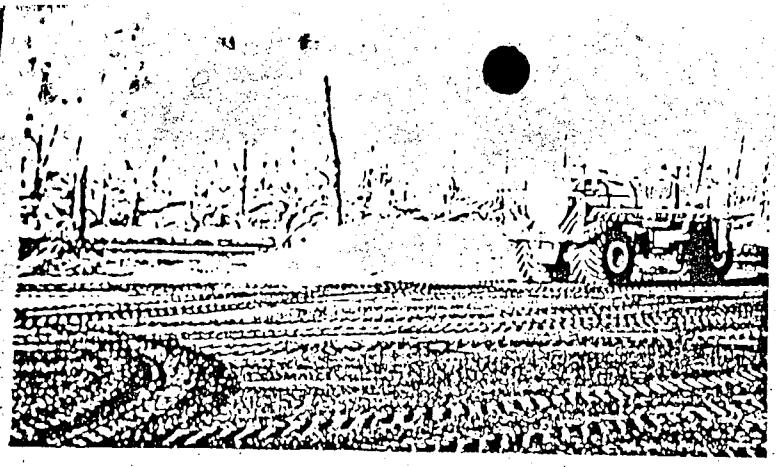


Fig. 1 — COHEREX is applied to slurry lagoon of abandoned coal mine to eliminate airborne dust and siltation by water erosion. Vehicle is a 3-wheel farm tank truck, equipped with outriggers. Natural vegetation will re-grow in treated areas.

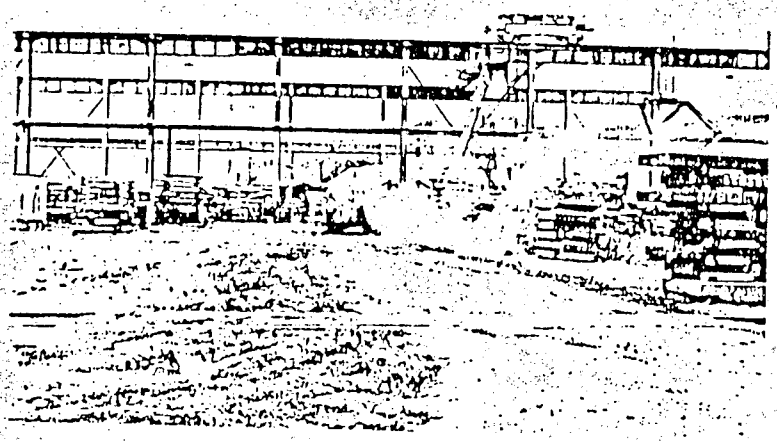


Fig. 2 — Dust is effectively controlled by application of COHEREX in steel plant storage yard.

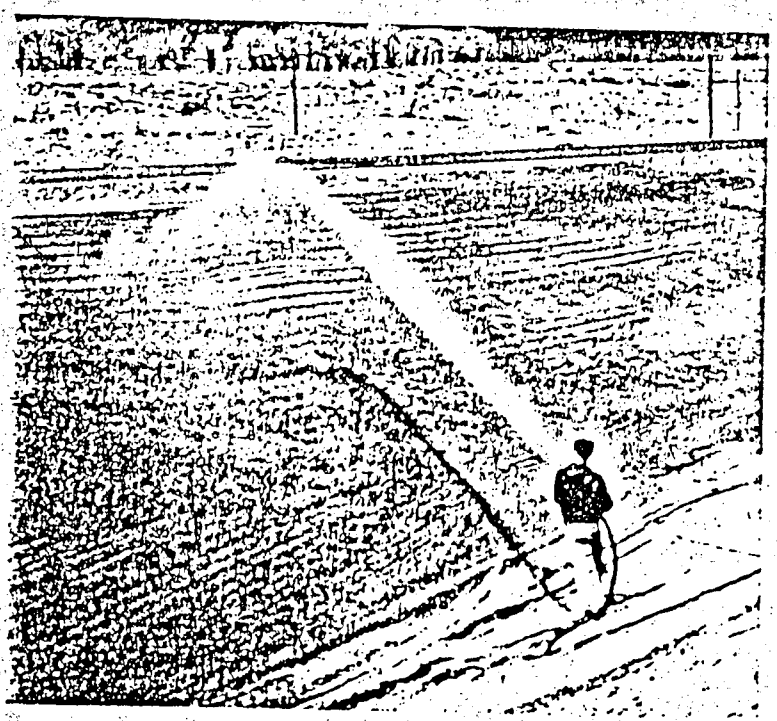


Fig. 3 — Recommended dilutions of COHEREX emulsion retards or prevents wind erosion of soils. Manual application is simple and is used to great advantage in many instances.

- ECONOMICAL

  Completely miscible in any cold water regardless of the dilution ratio. Because it is concentrated you use less. The dilution ratio controls thickness of coating and depth of penetration.

- HIGHLY STABLE

  Can be stored in clean containers for long periods with no change in quality. If stratification of diluted material occurs, simple agitation restores the mix. Being a water emulsion, *COHEREX* must be protected from freezing or boiling.

- LONG LASTING CONTROL

  Under Light traffic conditions the initial applications will last from three to six months. Subsequent applications will be necessary, with less solution required to maintain dust-free conditions. If undisturbed by traffic, the first treatment may last up to three years.

- NON-PHYTOTOXIC

  COHEREX dust retardant will not harm the root structure of plants.

- NON-FLAMMABLE

  Can be applied anywhere around industrial complexes and plants without danger of combustion.

- EASY TO APPLY

  COHEREX dust retardant does not clog application equipment. Standard equipment can be used – spreader trucks, hand sprayers, orchard sprayers or it can be metered through sprinkling systems.

- FAST DRYING

  Sandy and silty areas can be opened to foot traffic almost immediately after application.

- CLEAN

  COHEREX dust retardant is light in color. It won't stick to shoes or wheels. When properly applied it will not stain clothing or equipment.

- AIDS GERMINATION

  COHEREX dust retardant actually aids germination since it raises the ground temperature as well as prevents seeds from blowing away.

- SOIL STERILIZATION

  Sterilants added to diluted *COHEREX* dust retardant can be used to prevent growth of vegetation and resultant pollen which might affect delicate instruments.

TYPICAL PROVEN APPLICATIONS for *COHEREX* DUST CONTROL AGENT

AMUSEMENT PARKS
ATHLETIC FIELDS
AUTO PARKING LOTS
AIRFIELDS
BARBECUE AREAS
BASEBALL PARKS
BRIDLE PATHS
CAMPS
CEMETERIES
COAL PREPARATION PLANTS
CONSTRUCTION AREAS
COUNTRY CLUBS
DAIRIES
DIRT FLOORS
DRIVE-IN RESTAURANTS
DRIVE-IN THEATERS
DRIVEWAYS
ESTATES
FAIRGROUNDS
FOOTBALL FIELDS
FRUIT STANDS
GASOLINE STATIONS
HAUL ROADS
HOTELS
LAUNDRIES
MILITARY INSTALLATIONS
ORCHARDS
ORE TREATMENT PLANTS
PARADE GROUNDS
PARKS
PLAYGROUNDS
POLO FIELDS
POULTRY LITTER HOUSES
RACE TRACKS
RAILROADS
ROADS
ROAD SHOULDERS
RODEO GROUNDS
SCHOOL GROUNDS
TENNIS COURTS
TOURIST CAMPS
UNPAVED INDUSTRIAL PLANT AREAS
VINEYARDS
WALKS

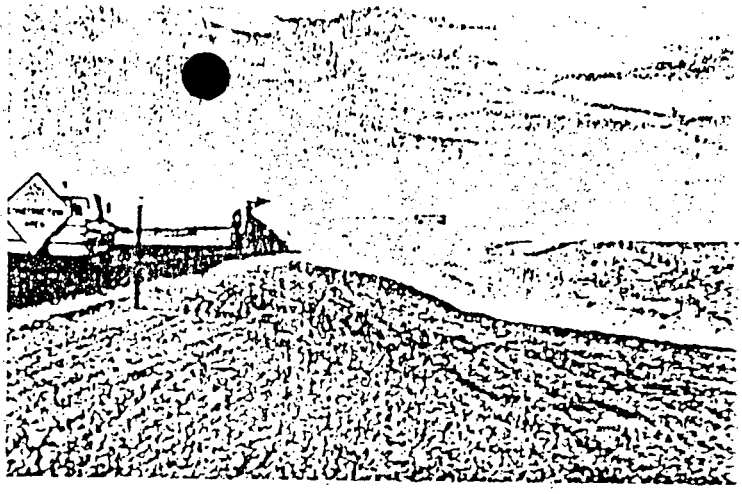


Fig. 4 – Embankments adjacent to this newly constructed California highway are stabilized with COHEREX emulsion to prevent washouts of seeded areas.

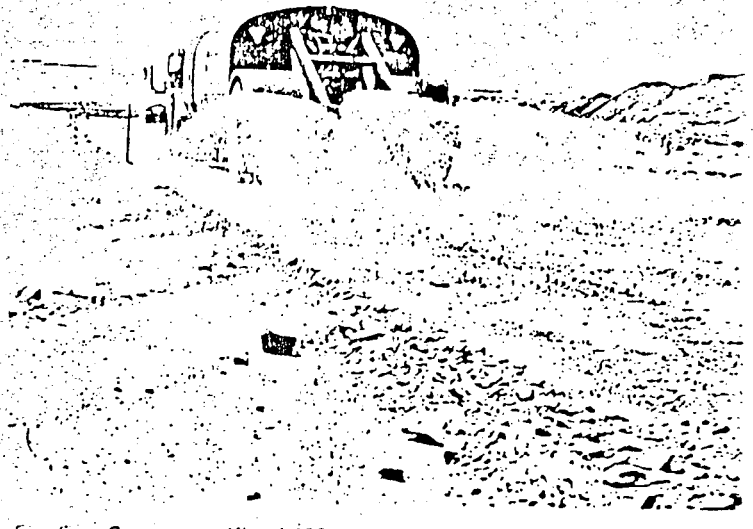


Fig. 5 – Constant traffic of 120-ton dump trucks at a New Mexico strip mine created clouds of dust all day long. Three tank trucks, including this 24,000 gallon giant, spray COHEREX periodically on haulroads to eliminate the dust problem.

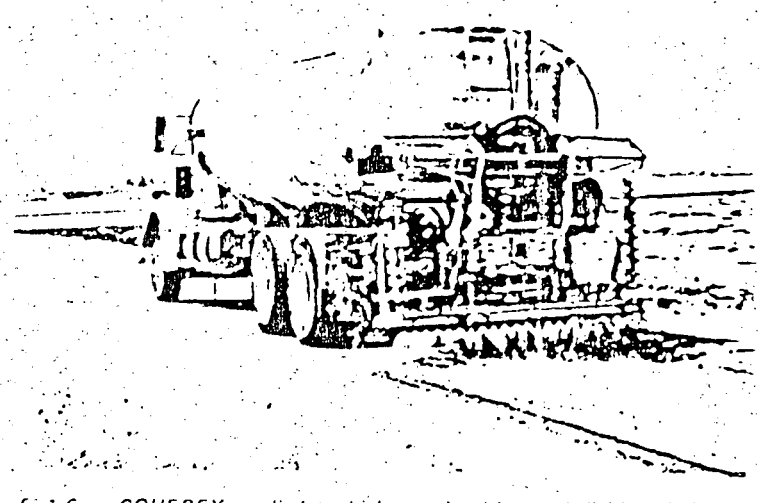


Fig. 6 – COHEREX applied to highway shoulders and dividers during construction prevents dust problems before natural groundcover develops.

DILUTION and APPLICATION

COHEREX dust retardant is supplied in concentrated form and should always be diluted with water shortly before use.

Standard spreader trucks or hand sprayers can be used for applying *COHEREX* dust retardant. A spraying pressure of 40-60 psi is recommended. The dilution should be distributed evenly over the entire surface to assure total agglomeration and coagulation of all loose soil particles. Dragging and leveling of the area to be treated is recommended to prevent runoff and the formation of puddles. If possible, compacting and rolling of the area before treatment provides maximum effectiveness of the dilution.

In general, one part *COHEREX* dust retardant concentrate to four parts of water provides the most practical and effective dilution for most applications. Since the depth of penetration is determined by the amount of fluid applied, and the thickness of the coating is determined by the amount of concentrate, the dilution ratio and application rate can vary according to prevailing dust conditions, anticipated traffic, type of soil and required use.

TYPICAL RECOMMENDED DILUTIONS

Dirt Roads, Driveways, Farm Service Roads, Road Shoulders and Utility Yards –

A 1:4 dilution applied at one gallon per square yard is sufficient to treat a one-half inch dust layer over hard sub-surfaces where relatively light traffic exists. It is recommended that this be applied in two one-half gallon applications. On dirt roads or any area where vehicular traffic is to use the facility treated with *COHEREX* it is recommended that re-treatment should be performed only when necessary to alleviate dust and not on a regular routine basis. This will prevent a build-up of resins which may develop an undesirable hard, impervious surface, as well as reduce costs.

Ballparks and Playgrounds –

1:7 dilution at one-half to one gallon per square yard will provide deep penetration that will immobilize the dust and maintain the soft, free-flowing properties of the soil. For less penetration and a heavier coating, a 1:4 dilution applied at a lower rate creates a surface that withstands wear and will bind dust blown onto the treated area or kicked up from underneath. Frequent and continued use will require retreatment.

Construction Areas –

To eliminate dust usually accompanying any type of construction in urban areas, relatively high dilutions ranging from 1:7 to 1:20 can be used according to severity. Frequency of application will depend on type of soil, traffic and local requirement.

Areas Covered With Loose Dust –

A 1:10, or even a 1:15 dilution of *COHEREX* dust retardant is advantageous where water has been used as a temporary dust palliative or for compacting a road under-surface. Repeated applications should be made as needed. The highly diluted dust-binder gives deeper penetration, better wetting, easier compaction, and improved adhesion, and a reduction in rate of evaporation of the water. This amounts to a considerable saving of money.

Sand Dunes –

A 1:4 dilution applied at a rate of from one-half to one gallon per square yard can be used to stabilize dunes by creating cohesiveness between the grains of sand and imparting a new property to the sand. This will retard shifting of the dunes, eliminate saltation, and stabilize the soil so that vegetation will take hold. It is important to stabilize the surrounding areas to prevent encroachment.

Liquid Mulch in Seeded Areas –

The dilution and application rate will vary according to type of soil and objective. A 1:4 blend is used in most cases, with the application rates varying from one quarter to one gallon per square yard.

COHEREX dust retardant is ideal for hydro-seeding. The seeds are mixed with the dilution, generally a 1:4 blend and sprayed over the area at a rate of approximately one-half gallon per square yard. This holds the seeds in place and prevents wind erosion damage to young seedlings. *COHEREX* dust retardant accelerates germination by increasing ground temperature.

Poultry Litter Houses –

A 1:3 dilution ratio will control litter dust and reduce respiratory diseases in chickens. There should be complete penetration before animals or poultry are allowed to use a *COHEREX* treated area.

Coal and Ores –

COHEREX dust retardant can be used to agglomerate fines in any material that is not water soluble. This includes treatment of ores and dust-proofing of coal. A 1:15 dilution of *COHEREX* dust retardant, at seven gallons per ton of coal, will eliminate practically all the dust. As an added benefit, because of the petroleum-based character of *COHEREX*, the BTU value of the coal is increased.

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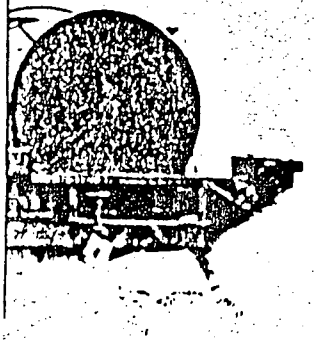


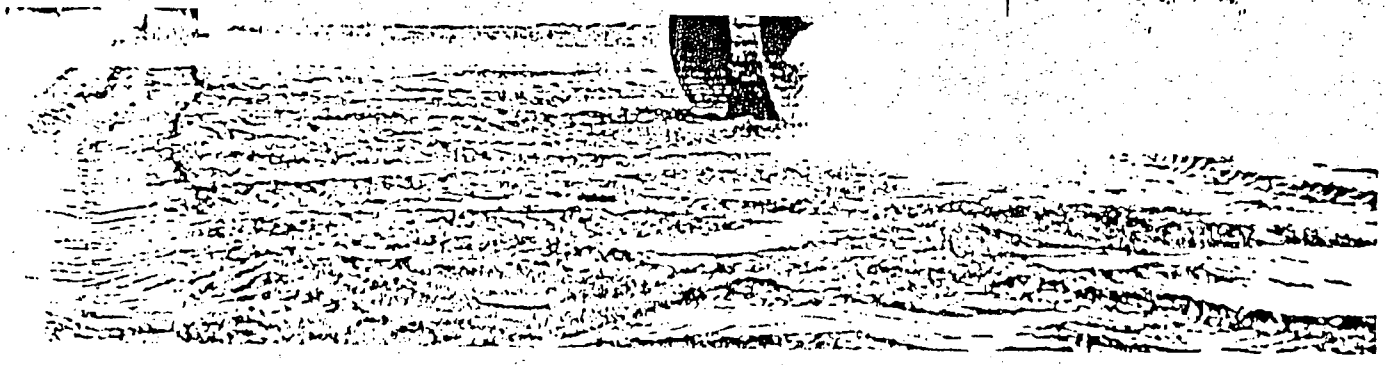


Fig. 7 – Application of COHEREX is quick and easy using hand spraying equipment or distributor trucks. Occasionally, special apparatus is used in problem terrains such as this large copper mine tailing pond.

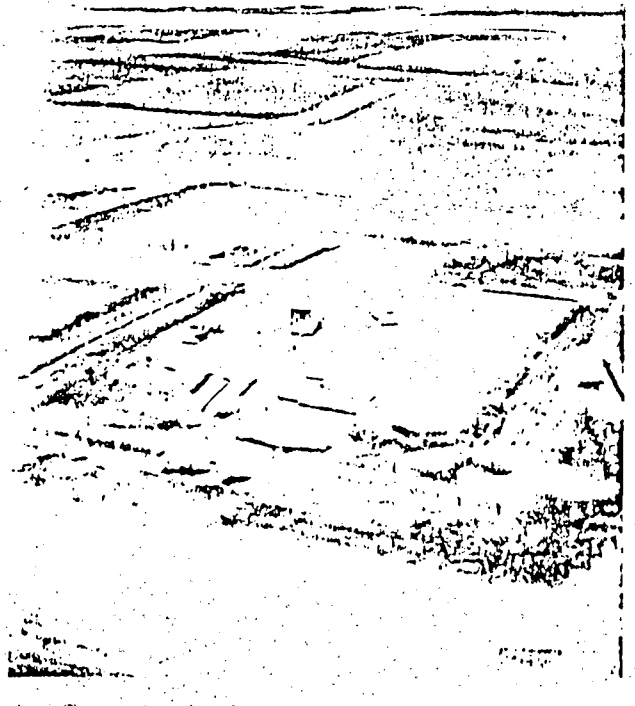


Fig. 8 – Although COHEREX emulsion aids germination and regrowth of plant life it can be used to prevent it in unusual circumstances. Pollen was as much of a problem as dust at this missile site. A sterilant was blended with COHEREX to solve both problems.

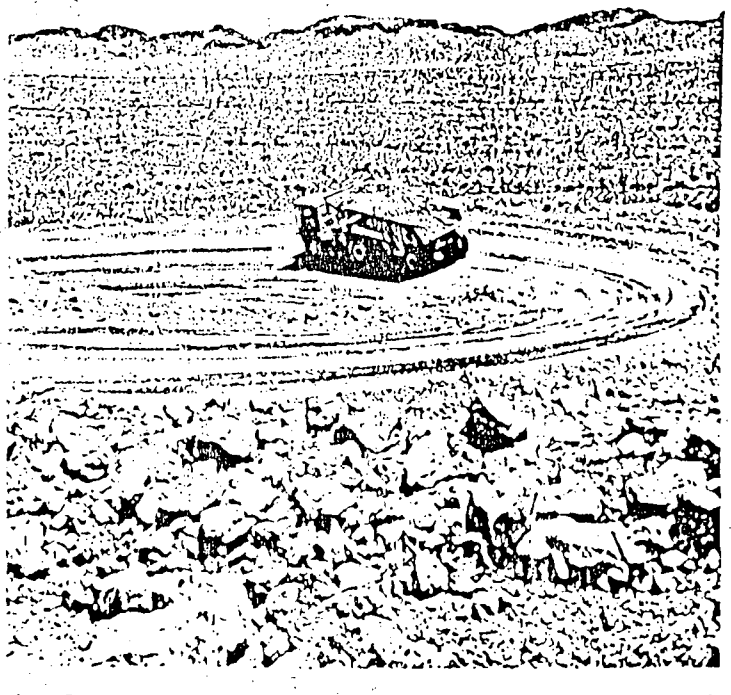


Fig. 9 – At this Arizona cement stone quarry, regular dust control treatments with COHEREX minimize soft and slippery roads; reduce labor costs over water spraying; reduce truck washings seven-fold; eliminate extra truck weight caused by mud buildup and prevent haul shift losses because of rain. COHEREX is also used in the garage and mill areas.

Gallons of COHEREX Concentrate Required for Areas of Various Sizes

SIZE OF AREA (In sq. yds.)	DILUTION: COHEREX 1 Water 4					DILUTION: COHEREX 1 Water 7				
RATE OF APPLICATION OF DILUTED MIXTURE (gal./sq. yd.)	½	¾	1	1¼	1½	½	¾	1	1¼	1½
100	10	15	20	25	30	6	9	13	16	19
200	20	30	40	50	60	13	19	25	31	38
500	50	75	100	125	150	31	47	63	78	94
1,000	100	150	200	250	300	63	94	125	156	188
2,000	200	300	400	500	600	125	188	250	313	375
4,840 (=1 acre)	484	726	968	1,210	1,452	303	454	605	756	908
5,000	500	750	1,000	1,250	1,500	313	469	625	781	938
10,000	1,000	1,500	2,000	2,500	3,000	625	938	1,250	1,563	1,875
20,000	2,000	3,000	4,000	5,000	6,000	1,250	1,875	2,500	3,125	3,750
50,000	5,000	7,500	10,000	12,500	15,000	3,125	4,688	6,250	7,813	9,375

Example: An area of 20,000 sq. yds. treated at the rate of ¾ gal. per sq. yd. of a 1:4 dilution of COHEREX will require 3,000 gals. concentrate and 12,000 gals. of water.

Gallons of COHEREX Concentrate Required Per Mile

WIDTH OF STRIP (In Feet)	DILUTION: COHEREX 1 Water 4					DILUTION: COHEREX 1 Water 7				
RATE OF APPLICATION OF DILUTED MIXTURE (gal./sq. yd.)	½	¾	1	1¼	1½	½	¾	1	1¼	1½
9	528	792	1,056	1,320	1,584	330	495	660	825	990
12	704	1,056	1,408	1,760	2,112	440	660	880	1,100	1,320
14	821	1,232	1,643	2,054	2,464	513	770	1,027	1,274	1,540
16	939	1,408	1,877	2,347	2,816	587	880	1,173	1,467	1,760
18	1,056	1,584	2,112	2,640	3,168	660	990	1,320	1,650	1,980
20	1,173	1,760	2,347	2,933	3,520	733	1,100	1,467	1,833	2,200
24	1,408	2,112	2,816	3,520	4,224	880	1,320	1,760	2,200	2,640
30	1,760	2,640	3,520	4,400	5,280	1,100	1,650	2,200	2,750	3,300

Example: Treating a strip 20-ft. wide with COHEREX diluted 1:4 at the rate of ½ gal. per sq. yd. will require 1173 gals. of COHEREX (plus 4692 gals. of water) per mile.

NOTE OF CAUTION: *Detailed treating instructions are available, and should be consulted to assure proper application. COHEREX should not be applied in its concentrated form. It is designed to be used in diluted form in accordance with recommended dilution ratios for specific applications.*

Witco Chemical
Golden Bear Division
P.O. Box 378, Bakersfield, California 93302
Tel.: 805-399-9501 393-7110
FTS 48-984-1011

Litho in U.S.A. 122710

Coherex

CLEAN, ECONOMICAL, LONG-LASTING DUST CONTROL

COHEREX is a product which has been developed as a result of years of extensive research and thorough field and laboratory testing.

Virtually everyone is familiar with the problem of dust – when carried in the air it damages crops, causes respiratory illness, affects visibility conditions, spreads disease and speeds up the natural forces of erosion. Unchecked, it adds to pollution and adversely affects our entire ecology.

COHEREX is an effective dust control agent that has been proven to eliminate the problems caused by airborne dust.

The important features of COHEREX and its application are discussed in this pamphlet. If you have additional questions, or would like additional literature, please contact your local distributor or the Golden Bear Division of Witco Chemical Corporation.

What is COHEREX?

COHEREX is a concentrated emulsion of petroleum oils and resins consisting of approximately 60% resins and 40% wetting solution. The resins are the film-forming, dust-binding portions; the wetting solution is the component which keeps the petroleum resin dispersed in finely divided particles and makes COHEREX readily miscible with water – even salt water. The resulting solution carries the resinous particles into the layer of dust to be penetrated.

How Does COHEREX Work?

When COHEREX contacts the dusty ground it coats the dust particles and forms cohesive membranes that attach themselves to adjacent particles. The chain-like bonds result in large "agglomerates" too heavy to be dislodged by movement of wind. The resulting over all increase in particle size actually immobilizes the dust and prevents it from remaining suspended in the air to be disturbed by wind movement or moving objects.

How Does COHEREX Differ From Conventional Palliatives?

COHEREX has greater flexibility of application because the thickness of the coating and depth of penetration can be controlled by varying the ratio of water dilution and therefore total volume of emulsion used per unit of surface. Efficient dust control for all kinds of soils can be obtained with maximum economy.

The liquid petroleum resins present in COHEREX have a much greater affinity to soil than ordinary mineral oils – therefore, greater dust-binding power.

Surfaces treated with COHEREX can, in most cases, be open to traffic shortly after application.

COHEREX is light in color and blends well with natural surroundings.

Because of its unique mode of application a uniformly thin film of COHEREX is formed on each dust particle. The resinous matter present coats the dust particles – with no excess to soil or stain clothing or equipment.

The resinous components of COHEREX provide more lasting results than conventional dust oils because they gradually form a hardened coating on the dust particles. This type of coating becomes more permanent with subsequent applications while a conventional oily film is subject to evaporation and percolation.

How is COHEREX Applied?

Since COHEREX is a concentrate, it is always diluted with water. Application is made by sprinkling the area with an amount of the diluted dust-binder sufficient to penetrate the layer of dust to whatever depth required. Spreader trucks, hand sprayers, orchard sprayers, or other standard equipment is used. For best application, spraying pressure should be approximately 40 to 60 pounds.

How Much Water Should be Used to Dilute COHEREX?

Three concentrations have been found to be most practical for all applications:

One part COHEREX to four parts water
One part COHEREX to seven parts water
One part COHEREX to ten parts water

The ratio of dilution selected depends upon the specific application and desired results.

It can be assumed that depth of penetration is controlled by the total amount of fluid applied, and the thickness of the coating is controlled by the amount of COHEREX concentrate in the fluid. Actual amount of concentrate in each particular case will, of course, depend on the prevailing dust conditions, anticipated traffic, and type of soil.

Under average conditions, such as those existing in parking lots and packed dirt roads, one to one and a half gallons of the 1:4 dilution per square yard will do an effective job. If accumulated loose dirt is not thicker than one-half inch, and traffic is light, one gallon of the 1:7 dilution per square yard will be sufficient. Where dust conditions are severe, such as on service roads and sandy vineyards, several applications are recommended — a one or one and a half gallon per square yard application of the 1:7 dilution; followed preferably after several hours by a one gallon per square yard application of the 1:4 dilution. In many cases, it will be advantageous to make the second application after several days, when traffic over the area has packed the dust. When alleviating dust conditions is to be combined with packing down of an area over which a hard-surface highway is to be constructed, drenching the area with a 1:10 solution to the point of complete saturation is recommended. Under continued traffic any area will have to occasionally be retreated.

The area to be treated with COHEREX should be dragged or leveled so that runoff and formation of puddles will be avoided.

The following examples may serve as further illustrations: On ball parks and playgrounds, for instance, deep penetration on a thin coating of dust particles can be obtained by drenching the ground with a highly diluted mixture. (A 1:7 dilution will immobilize the dust only, and will maintain the soft free-flowing properties of the sand.) Somewhat less penetration and a heavier coating can be obtained by using a more concentrated mixture of dust-binder and water. (A 1:4 dilution applied at a lower rate will give a surface which will better withstand wear, and will bind dust blown onto the treated area.)

On dirt roads, driveways, and utility yards, with relatively thin layers of dust over hard sub-surfaces, application of a more concentrated mixture in moderate amounts will produce the desired complete penetration down to the hard sub-surface with a sufficiently heavy coating of the dirt particles. (A 1:4 dilution applied one-half gallon per square yard will suffice to treat a dust layer of approximately ½-inch thickness.) Retreatment will be necessary.

On areas covered with large amounts of loose dust, which should be settled or packed down, high dilution with water is recommended. (A 1:10, or even a 1:15 dilution, of COHEREX will be found advantageous in all cases where water is at present used as a temporary dust palliative or as a means of packing a road under-surface.) It will be found that this application will save considerable time, labor and water. The highly diluted dust-binder gives better penetration, better wetting, tighter packing, improved adhesion, and a reduction in rate of evaporation of the water — all of which amounts to a considerable saving of money.

On road shoulders and farm service roads the application of a moderately concentrated mixture in high amounts is recommended. In many cases it will prove most practical to give the surface two applications. (On ranch roads, for instance, a 1:4 dilution applied 1 gallon per square yard, followed a few days later by a one-half gallon per square yard application, will give the most satisfactory results.) These two applications will convert dusty roads into compact road surfaces over which traffic can move at normal speeds without stirring up dust to drift onto crops.

Retreatment of dirt roads should be done only when necessary to alleviate dust, not on a regularly scheduled, routine basis. This will reduce costs and will prevent a buildup of resins which may develop an undesirable, hard, impervious surface.

How Stable is COHEREX?

COHEREX concentrate is a highly stable emulsion. It can be stored for long periods without impairing its quality if kept in clean containers. Diluted COHEREX should preferably be used within one day since prolonged storage might result in stratification. If stratification should occur, simple stirring will

restore the mix to normal conditions (if protected from freezing or boiling). Stratification should not be confused with the breaking of the emulsion, which will not occur if clean equipment is used. It is merely a settling of the concentrate at the bottom of the container.

How is COHEREX Diluted?

COHEREX can be diluted with any amount of water, giving a mixture which does not require any special agitation other than the normal amount of vibration of the spray truck. Dilution occurs by pumping or pouring the desired amount of water into the concentrate. Excessive foaming can be avoided by having the inlet of the water below the concentrate level.

How Long is COHEREX Effective?

Years of experience with a variety of soils show that under normal conditions, following approved recommendations, the first application will be fully effective for from four to six months. The second, and each subsequent application, for approximately a year. After dusty areas have been treated for a number of seasons with COHEREX, smaller amounts are required for maintenance of dust-free conditions.

What are the Extras You Get with COHEREX?

COHEREX is the most economical product available to combat dust. It is completely miscible in cold water, regardless of dilution ratio. It's concentrated – so you use less.

COHEREX is safe. It is non-toxic to animals when completely absorbed into the ground. A coating of liquid emulsion raises the ground temperature, and can actually aid germination. If growth is undesirable, a sterilant can be introduced into the COHEREX solution. This has been done at many military installations.

COHEREX is non-flammable. It can be used on location at processing plants without fear of combustion.

COHEREX is easy to apply. It is free-flowing and provides a uniform spread. Feed pipes will not clog.

COHEREX is fast drying. Sandy and silty areas can be opened to foot traffic immediately after application.

COHEREX is clean. It is desirable for places where children play and adults congregate – it doesn't stick to shoes.

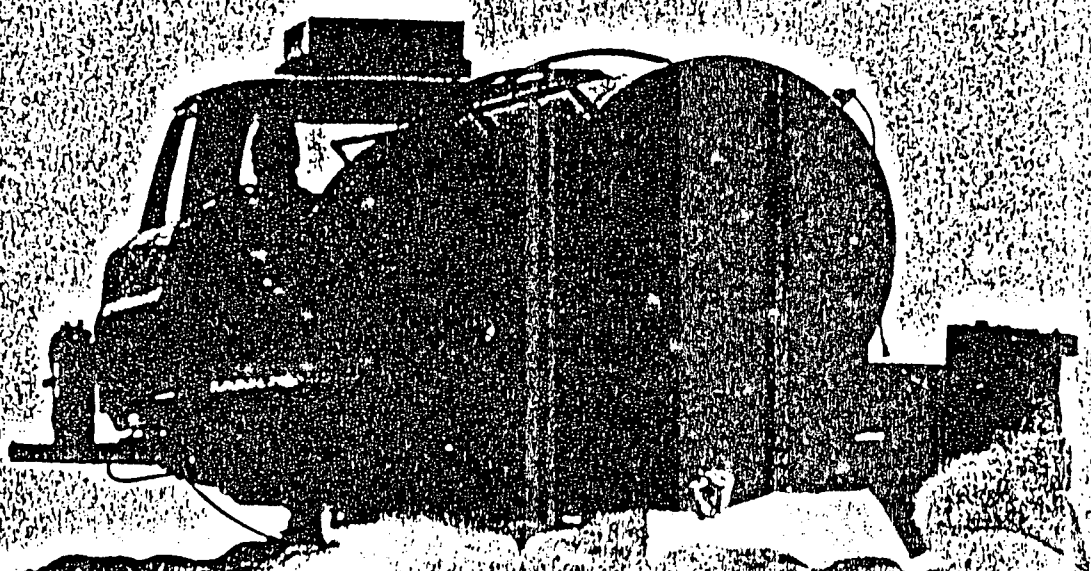
NOTE OF CAUTION: Detailed treating instructions are available, and should be consulted to assure proper application. Under no circumstances should COHEREX be applied in its concentrated form. It must always be used in diluted form in accordance with recommended dilution ratios for specific applications.

PROVEN APPLICATIONS FOR COHEREX

- AMUSEMENT PARKS
- ATHLETIC FIELDS
- AUTO PARKING LOTS
- AIRFIELDS
- BARBECUE AREAS
- BASEBALL PARKS
- BRIDLE PATHS
- CAMPS
- CEMETERIES
- COAL PREPARATION PLANTS
- CONSTRUCTION AREAS
- COUNTRY CLUBS
- DAIRIES
- DIRT FLOORS
- DRIVE-IN RESTAURANTS
- DRIVE-IN THEATERS
- DRIVEWAYS
- ESTATES
- FAIRGROUNDS
- FOOTBALL FIELDS
- FRUIT STANDS
- GASOLINE STATIONS
- HOTELS
- LAUNDRIES
- MILITARY INSTALLATIONS
- ORCHARDS
- ORE TREATMENT PLANTS
- PARADE GROUNDS
- PARKS
- PLAYGROUNDS
- POLO FIELDS
- POULTRY LITTER HOUSES
- RACE TRACKS
- RAILROADS
- ROADS
- ROAD SHOULDERS
- RODEO GROUNDS
- SCHOOL GROUNDS
- TENNIS COURTS
- TOURIST CAMPS
- UNPAVED AREAS AROUND INDUSTRIAL PLANTS
- VINEYARDS
- WALKS

Witco Chemical
Pioneer Division
802 Ash Street, Lawrenceville, Illinois 62439
(Toll-Free #) 800-851-5741 OR 618-943-3341

The Coherex® dust control manual.



Vitro

Contents

Coherex accelerates and aids in germination of seeds and protects vegetation from being destroyed by blowing sand.

The story of dust and the importance of Coherex dust retardant.

This manual is designed to help you use Coherex® dust retardant effectively, efficiently and economically. It provides thorough descriptions of the properties, performance characteristics and application recommendations.

And since an understanding of the nature of wind and soil is essential in any effort to control soil erosion, we have also included sections on those topics.

All facts have been collected by the Golden Bear Division of Witco Chemical Corporation in laboratory and field tests and by data reported in literature supplied by other investigators. Although this manual contains pertinent information needed for the control of almost all dust problems, if you have additional questions, please contact your local distributor or the Golden Bear Division.

What is dust?

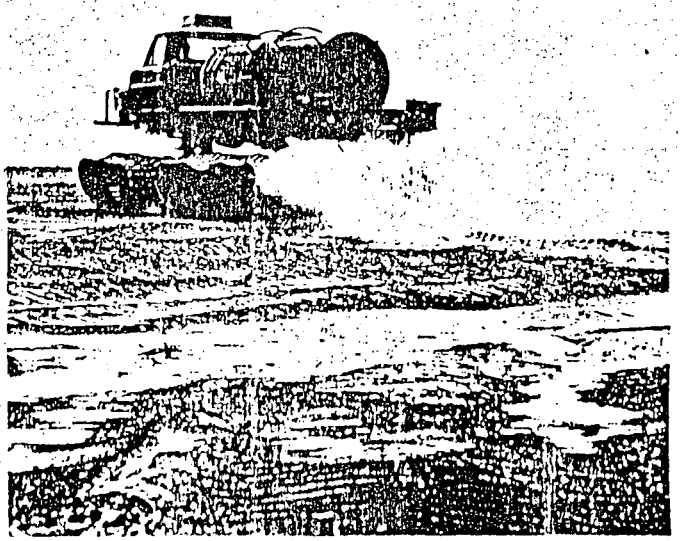
Dust, more prevalent than any other atmospheric contaminant presents a danger you can see, breathe, touch. It is estimated that the amount of dust suspended in the atmosphere is about 100,000 tons per cubic mile of air, depending on wind velocity and size of dust particles.

Dust is a health hazard to people and animals. Annoying and irritating, it can carry diseases and produce serious respiratory illnesses.

In addition, dust causes costly damage to crops, property and machinery. It can carry away seeds, retard germination, and seal parts of leaf surfaces, preventing intake of carbon dioxide and water needed by plants. The estimated cost to agricultural products and machinery runs into millions of dollars each year. Even maintenance costs mount because dust accumulation demands more frequent cleaning and painting.

All outdoor areas, especially those which are unpaved, have one thing in common — dust. Minute airborne particles reduce profits by discouraging attendance and cutting gate receipts in amusement parks, drive-in movies, rodeos, athletic fields, and the like. Dust problems seriously hinder efficiency and safety at airports, military installations, industrial facilities and mining complexes.

As a result, everyone living, working or owning property in areas menaced by dust has a stake in clearing the air — a task made possible with the effective, economical dust-control agent, Coherex.



Application of Coherex is easy, but occasionally special apparatus is required to travel over and spread in certain terrains, such as this large copper mine tailing pond.

General principles of wind erosion and dust control.

Research departments in almost all scientifically oriented companies, such as Witco, recognize the need for more than one measure to correct adverse conditions with lasting results. The effective control of dust and soil erosion is no exception, as shown by the wide range of applications which Coherex dust control agent makes possible.

The basic operations used in the control of soil erosion include:

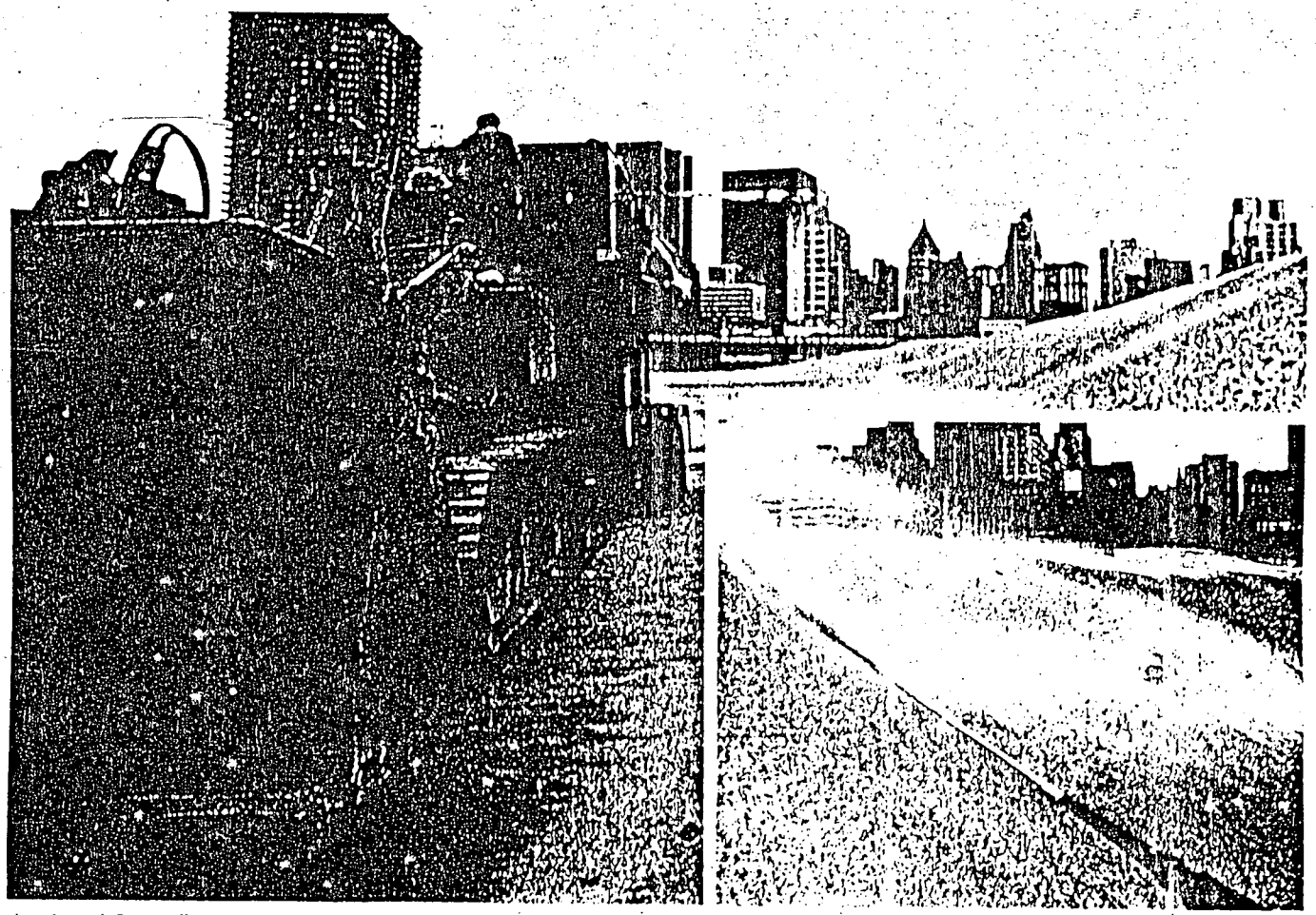
(1) Erection of windbreaks.
(2) Establishment of vegetation.
(3) Stabilization of the soil itself.

The following sections of this manual will describe how Coherex can be used to advantage in all three of these operations. Of more immediate concern is a brief summary of the causes and effects of the action of wind on soils.

Modes of soil movement.

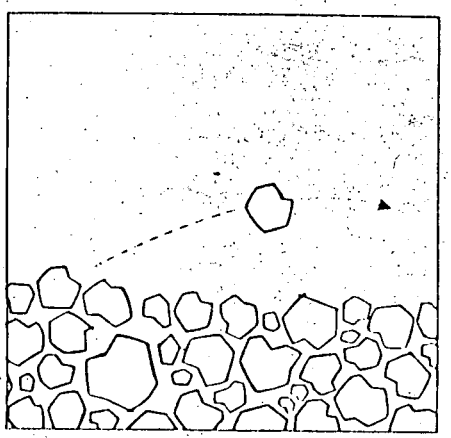
Wind erosion of soil takes any of three modes of soil transport: saltation, surface creep and suspension. All three are aggravated by dry climate, bare soil, lack of some form of windbreak, heavy traffic and faulty cultivation practices.

Saltation is the bouncing, jumping motion of sand grains driven by the wind relatively close to the ground surface. The bouncing grains strike the ground at a flat angle (10 to 16 degrees), bouncing either into the air again or dislodging other grains. Seldom do any saltating particles rise more than three or four feet; the bulk of saltation occurs within a few inches of the ground. This type of movement is caused by the effects (lift and drag) of

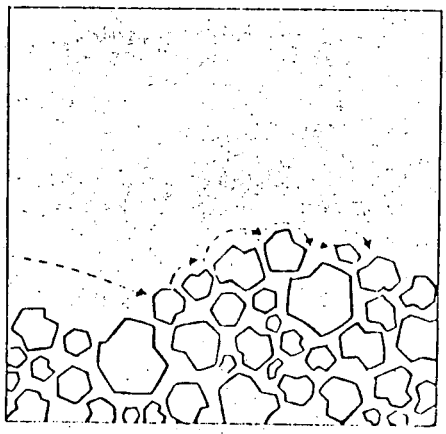


Sand from fill surcharge was creating problems during winds, so Coherex was sprayed over the 15-acre area to form a wind-resistant cover.

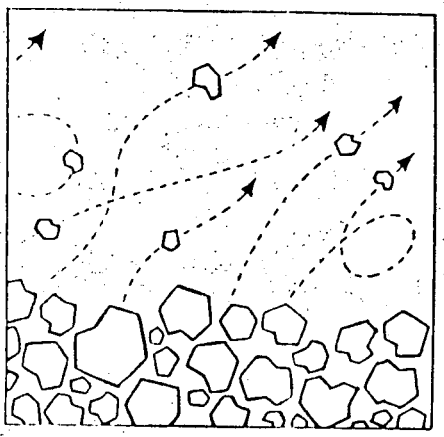
Modes of Soil Movement.



Saltation.



Surface creep.



Suspension.

direct pressure of the wind on the soil particles and by their collision with other particles. Saltating grains can move, by the force of impact, particles over 200 times their own weight. Soil that is moved by saltation consists mainly of fine grains 0.05-to 0.5 mm in diameter. Grains in saltation move faster, farther and higher over hard surfaces, where there is no surface creep. Blown sand usually has a predominant diameter of 0.15 to 0.3 mm; but never less than 0.08 mm.

Surface creep is the slow movement of the soil surface which is caused primarily by the direct impact of saltating grains on particles that are too heavy to be dislodged and bounced into the air. Such particles vary in diameter from 0.5 to 1 mm. Most of the kinetic energy in the surface creep phenomenon is supplied by impact of grains moving in saltation, little by the direct pressure of the wind.

Suspension is the transporting by wind of small particles less than 0.1 mm in diameter. Particles of this size have a lower falling velocity than the upward velocity of the turbulent winds and are carried by eddies moving in all directions. These small particles, after having been dislodged from the surface by saltating grains or by mechanical disturbances, such as traffic, can be transported long distances.

Of these three modes of soil movement, saltation accounts for up to three-quarters of the total soil movement.

Classifications of soils.

Soil technologist, W.S. Chepil, established the theory that all mineral soils can be classified on the basis of four ranges of particle sizes with varying responses to wind action. These four fractions are:

Fraction	Particle diameter (mm)	Wind susceptibility
A	< 0.42	Highly erodible
B	0.42- 0.84	Difficultly erodible
C	0.84-6.4	Usually nonerodible
D	> 6.4	Nonerodible

The Golden Bear Division of Witco, using a series of mesh sieves, makes a further breakdown in the fine particle size. This is necessary because Chepil is mostly concerned with agricultural soils, while the research for Coherex is aimed at soils in general and largely soils not under cultivation. The six fractions are:

Sieve Size	Theoretical diameter (mm)	Classification
Passing 200 mesh	< 0.074	(1) Dust grains
Passing 60 mesh but retained by 200 mesh	0.074 -0.250	(2) Fine sand grains
Passing 30 mesh but retained by 60 mesh	0.250 -0.590	(3) Intermediate sand grains
Passing 10 mesh but retained by 30 mesh	0.590 -2.000	(4) Coarse sand grains
Passing 4 mesh but retained by 10 mesh	2.000 -4.760	(5) Small clods or rocks
Retained by 4 mesh	> 4.760	(6) Large clods or rocks

The physics of wind as related to soil erosion.

Winds are usually classified by speed, direction, and turbulence. Significantly, surface winds are turbulent for all velocities over approximately 2 to 3 m.p.h. Wind velocity decreases substantially toward ground level due to frictional drag. Since soil erosion is strictly a surface phenomenon, the wind speeds and turbulence to be considered in connection with soil erosion are those at, or close to, the ground. This turbulence is usually observed as gusts causing localized soil disturbance. The minimum velocity required to start soil movement (threshold velocity) varies with grain size. The threshold velocity for grain sizes 0.1 to 0.15 mm is 8 to 9 m.p.h. at six inches above ground. It is an interesting fact that above and below this grain size (0.1 to 0.15 mm) threshold velocity increases. The range of threshold velocity for all grain sizes is from 13 to 30 m.p.h. at a height of one foot above the surface.

The action of wind is, basically, twofold: (1) it separates the soil into two fractions by removing and then depositing elsewhere the highly erodible grains, leaving wind-stable particle sizes behind; (2) it provides the energy for saltation.

The amount of soil eroded by wind is contingent on wind velocity, height of protruding non-erodible particles, and the distance between protrusions. According to J.H. Stallings, the height that slows wind velocity to 9 m.p.h. or lower, is called the "critical height," and the ratios of height of projection to the minimum distance between projections which will prevent the movement of erodible fractions is designated as the "critical surface-roughness coefficient." These are the most important factors to be taken into account when considering the interactions of winds and soils.

Stallings, using Chepil's terminology, lists five forms of wind erosion:

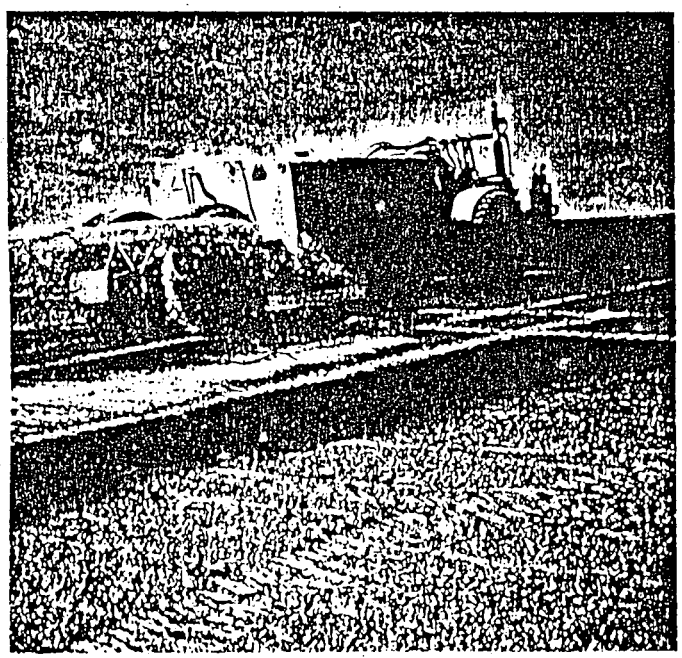
(1) Detrusion: dislodgment of coarse grains projecting from the surface, caused by the pressure of the wind and by the bombarding action of erosive grains coming from the windward side.

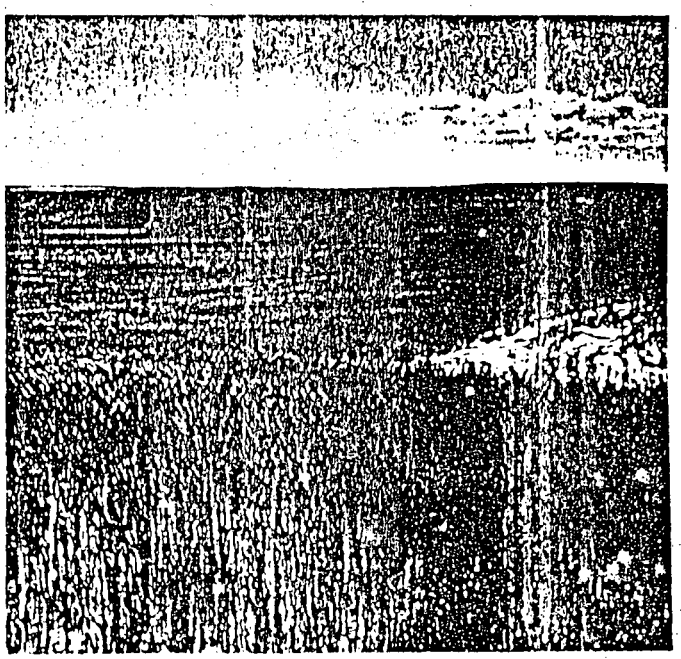
(2) Effluxion: removal of grains 0.05 to 0.5 mm in diameter, caused principally by saltation.

(3) Extrusion: forward thrust of soil particles which are too coarse to be removed in saltation.

(4) Efflation: removal of fine particles susceptible to transport by suspension, leaving the coarser soil particles behind.

(5) Abrasion: chipping off of particles under the impact of saltating grains.





Coherex being sprayed over a large borrow area that has been seeded. The resulting growth is shown at right. Coherex holds the seeds from being blown away and aids in germination.

Causes of soil instability.

The prime conditions favoring susceptibility of soil to erosion are:

(1) Lack of cohesiveness (loose and dry soil).

(2) Lack of protective cover (smooth and bare ground).

(3) Lack of shelter from wind (large, unsheltered areas).

A high content of erodible fractions (dust-size particles), by itself, is no cause for erosion. In fact, soil consisting almost exclusively of fine dust is very resistant to erosion by wind as long as the soil surface is smooth and fairly level. Without the impact of saltation, only small amounts of dust are raised from such soils and then only due to disturbance by moving objects. It has been found that naturally wind-stable soils, consisting of a mixture of grain sizes, have a certain balance of particle sizes, including enough fines to embed properly the coarser particles. On the other hand, a pebble surface represents a reservoir for fine materials if the wind is of low velocity and, subsequently, a source of these materials if the wind velocity increases.

Without going into a comprehensive study of corrective possibilities, it is enough to mention that most soil technologists recommend the following basic measures to minimize the effect of winds on soil:

(1) Erect windbreaks (trees are best).

(2) Plant vegetation for soil cover (native grasses are often, but not always, the most suitable).

(3) Impart cloddiness to the soil (correct tillage).

These three basic measures, however, predate the development of adhesive stabilizers and at best are a temporary remedy when used by themselves. Coherex, with its resinous adhesive base, not only supplements the above measures, but is in itself effective as an easy-to-use and economical dust control agent.

Dust control agents.

All agents used to combat dust employ one of the following four active ingredients:

(1) Water.

(2) Oil.

(3) Natural vegetable matter (mulch).

(4) Resinous adhesives (natural or synthetic).

Water: The active ingredient of all hygroscopic materials such as calcium chloride and organic sulfonates, water is the most harmful agent. It is erosive; its effect is temporary. As soon as the water evaporates, the soil becomes more fragile and thus dustier. It is obvious that hygroscopic materials are ineffective wherever humidity is low. They are also of little use in areas of frequent and heavy rainfall.

Oil: The effective ingredient of all conventional petroleum-based dust palliatives such as neutral oils, waste oils, crankcase drainings and asphalt, oil is dependent on wetting the soil with a product more viscous than water. Oil is not held tightly by the soil, only soaked up by the spaces between soil particles, and therefore it has the following disadvantages:

(1) It percolates away.

(2) It is displaced and floated to the surface by rain.

(3) It gradually evaporates (oil of sufficiently low viscosity to be sprayable also has a high rate of evaporation)

(4) It lubricates the soil particles instead of binding them together.

(5) It is toxic to plants.

Mulching: The two principle aims of mulching are to shelter the surface from the action of winds and to produce sticky decomposition deposits, which impart cohesiveness to the soil. Most soil experts agree that soil improvement by mulching is short-lived and frequently increases susceptibility to erosion after the organic matter has decayed. The decaying process also lessens fertility due to increased soil bacteria feeding on natural or chemical fertilizers in the soil. Mulching is only successful when it is possible to establish a crop cover quickly.

Resinous adhesives: These dust control agents are basically soil conditioners which improve the structure of soil rather than mere palliatives which temporarily relieve dust conditions. The problem here is usually high cost and limited effectiveness. The high cost of such resinous adhesives stems from the lack of inexpensive raw materials and, therefore, the added cost of synthesizing. Effects of weather and soil bacteria cause the adhesives to lose their stickiness, limiting the conditioning effect.

Coherex, produced from natural petroleum resins which are highly resistant to weathering and soil bacteria, is the most effective and most reliable resinous material available to combat dust. Coherex is economical because it is produced from petroleum fractions containing, in abundance, the desirable resins preformed by nature.

What Coherex is and how it works.

Coherex is an effective dust control and wind erosion agent and is a stable, concentrated, nonvolatile emulsion consisting of approximately 60 percent semiliquid natural petroleum resins and 40 percent wetting solution.

In this special patented formula, the nonvolatile resins are the film-forming, dust-binding portion of the preparation.

The wetting solution is water containing a combination of wetting agents and sequestering agents which serves four purposes:

(1) Disperses the resins into fine particles which can be kept suspended in the emulsion, making Coherex a preparation readily miscible with water in all proportions.

(2) Increases the spreading power of the diluted emulsion.

(3) Facilitates penetration of the resinous particles into soils.

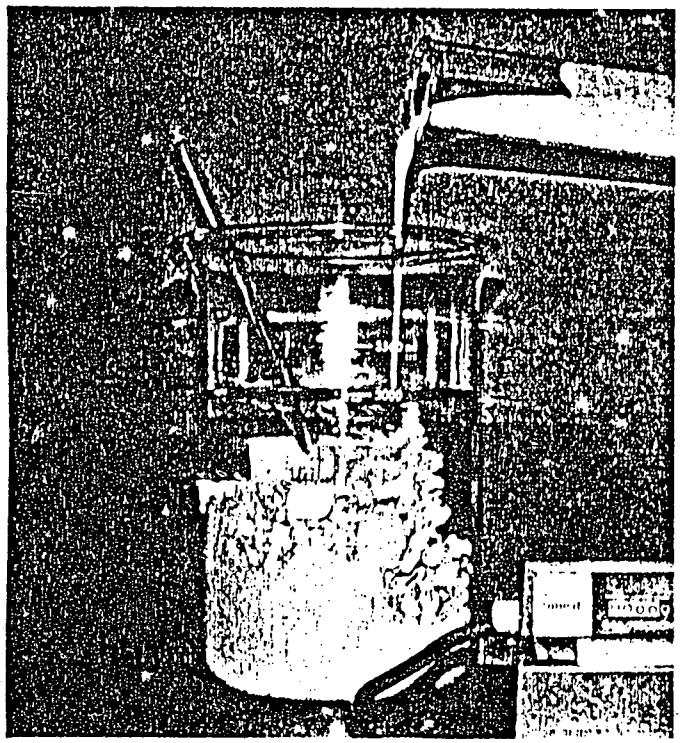
(4) Stabilizes the preparation against hard water, permitting dilution of the emulsion with almost any water available.

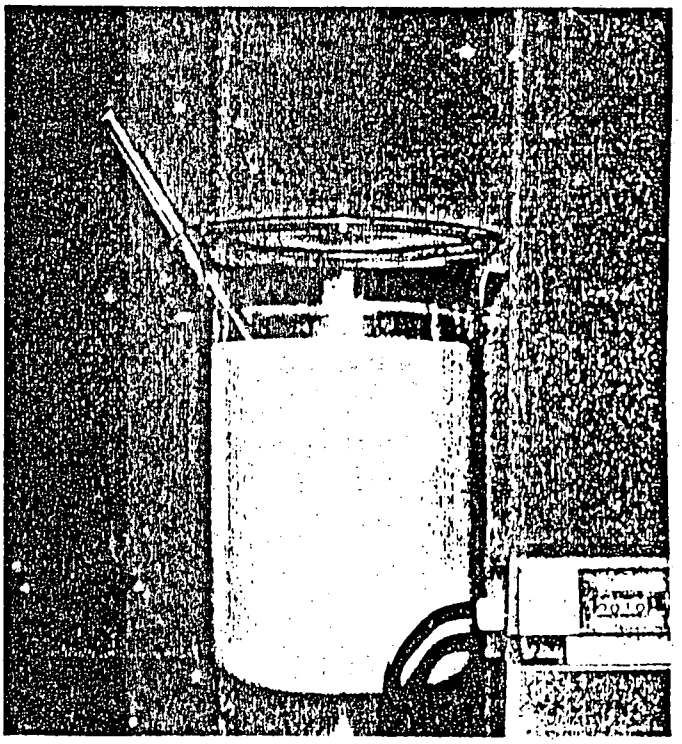
The water contained in the concentrate is an integral part of the preparation. It is the solvent for the wetting and sequestering agents and is proportioned in the concentrate in an amount assuring greatest storage stability and ease of handling.

Additional water added to the concentrate before use, in amounts recommended at the end of this manual, serves as a diluent to assure greatest economy and increase penetration into the dust layer.

The cohesive approach.

Soil conditioning: Coherex provides a modern method for erosion control through proper soil conditioning. In wind-resistant native soils, a correct balance of fine and coarse particles provides the required cohesiveness to resist the impact of saltation, the start of all erosion. Obviously, it would be hardly economical or feasible to change, on a large scale, the given composition of soils in order to establish the desired particle size distribution. Such measures would, for instance, require the addition of 10 to 15 parts of silt and clay-size particles to sand dunes or, vice-versa, the incorporation of large amounts of sand into clay and silty soils.





Coherex's free miscibility in almost any water – even sea water – makes it easily handled. If left in spray equipment or storage tanks over long periods, simple agitation or circulation quickly returns it to its original state.

Soil stabilization: Treatment of soils with Coherex represents an entirely new approach to soil stabilization in that the required cohesiveness is imparted to the soil without drastically altering its original make-up. The concept that this effect would be desirable is not new, but a truly effective product to achieve the result economically was not previously available. Asphalt has been used in various forms as a kind of adhesive, but it was found that it loses its stickiness quickly on exposure to the elements. Decomposition products of vegetable matter (mulch residue) were also found to function as adhesives, but only for a short period of time. Furthermore, most of these materials proved not only ineffective, but detrimental to the soil shortly after application as well.

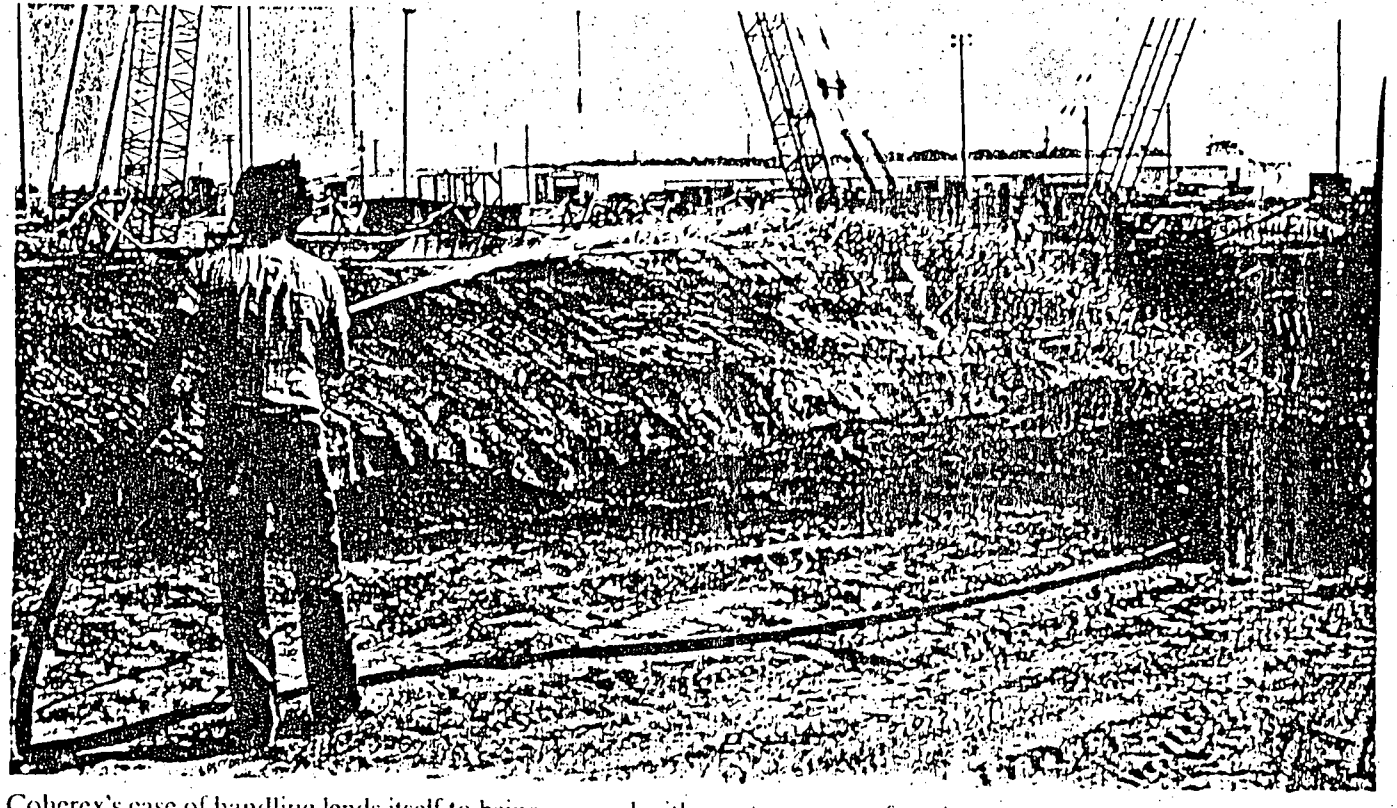
Development of Coherex for treatment of soils started with the realization that the three types of movement of soil can be arrested by imparting such strong and prolonged cohesiveness to the soil that:

(1) Particles in saltation cannot dislodge other soil particles, but become trapped by the strongly cohesive, nonelastic soil.

(2) Creep, which is movement of the soil under the impact of saltation and the forces of wind, cannot take place as the upper layer of the soil itself is converted into a cohesive soil cover that is difficult to move.

(3) The fines, which are susceptible to air suspension, are eliminated from the soil by agglomeration into larger coherent particles.

This concept of arresting the three modes of soil movement by the introduction of a resinous adhesive constitutes the theoretical foundation for the method of dust control developed by the Golden Bear Division of Witco Chemical Corporation. In other words, the Coherex approach to stabilization of soils against wind erosion is the substitution of a resinous cementing agent for the fines which are required for the apparent cohesiveness in naturally wind-stable soils.



Coherex's ease of handling lends itself to being sprayed with most any type of equipment, even hand-held hoses.

Performance characteristics of Coherex.

Coherex is superior to conventional dust palliatives in several respects. It is clean, efficient, economical, easy to apply, and safe. It is clean because it is light in color, and when properly applied does not excessively soil or stain clothing or equipment. It is efficient and economical, because only the amount required to bind the individual dust particles is needed. Ease of application is assured by its free-flowing characteristics under normal conditions. It is safe, because it is nontoxic to plants and animals and is nonflammable.

A surface treated with Coherex can usually be opened to foot traffic immediately after application — no muddy or sticky clods are formed to cling to shoes or wheels. In soils containing high amounts of clay, however, the surface should be allowed to dry somewhat before exposing it to traffic.

Coherex concentrate can be stored for long periods of time (up to one year or more) if kept in clean containers and if protected from boiling or freezing. Diluted Coherex should be used within one day, since prolonged storage might result in stratification. If a batch of diluted Coherex should stratify, the batch can be restored to usable condition by stirring or agitation — there is no need to re-emulsify the product. The high stability of Coherex in storage and handling contributes greatly to the economic value of the product, assuring no loss of material by spoilage.

Since treatment with Coherex leaves a cumulative residue of the resins deposited on the soil particles, areas once conditioned with Coherex require only occasional re-treatment to bind "new" dust which has blown or drifted onto the area or which has been stirred up from beneath. Under normal atmospheric conditions, and if the recommendations outlined in this manual are followed, the first application will be fully effective for six to ten months and each succeeding application for approximately one year. If undisturbed by traffic, the initial treatment may last for three or more years. The lasting effect of regular treatments can be observed at Edwards Air Force Base, California, which is today a dust-free area in the middle of the desert, requiring only infrequent applications to maintain dust control.

Coherex has great flexibility in application, because the thickness of the resinous coating and the depth of the penetration into the soil can be readily controlled by varying the ratio of water to concentrate, as well as the total volume of fluid used per unit of surface. Thus, the applicator is able to design the application to provide highest efficiency combined with greatest possible economy.

When determining the amount of Coherex concentrate and the amount of water to be used, it should be kept in mind that depth of penetration is controlled by the total amount of fluid applied (concentrate plus water) and that the thickness of the deposit of resins on the dust particles is controlled by the amount of Coherex concentrate in the fluid applied. The amounts of concentrate and water to be used in each particular case will depend on the prevailing dust conditions, the anticipated traffic, and the type of soil.

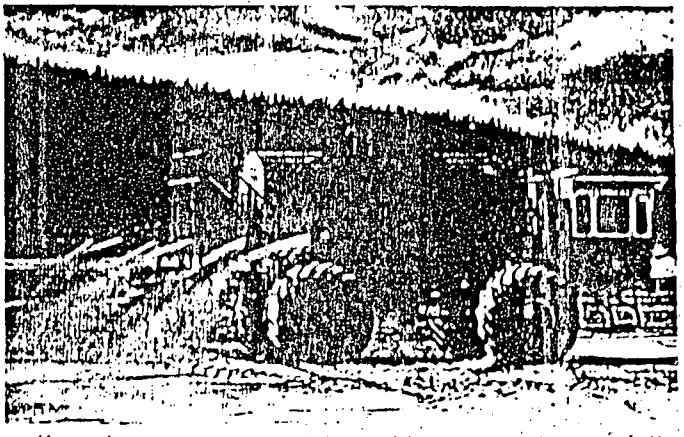
The type of soil influences both the amount of fluid required to saturate it and the time required to reach the depth of penetration desired. The following figures might serve as a guide for determining how various types of soils should be treated. The approximate amounts of fluid required for total wetting of the three basic types of soil are:

Sand	17 gal. per cu. yd.
Silt	27 gal. per cu. yd.
Clay	44 gal. per cu. yd.

The approximate depth of penetration attained by the use of 1½ gallons of fluid per square yard is:

Sand	2 in.
Silt	1.5 in.
Clay	0.8 in.

Since the rate of penetration is rapid in sand, moderately fast in silt, and slow in clay, satisfactory results



Spraying Coherex at a large tailing pond with specially designed equipment.

are obtained in predominantly sandy soil with one application consisting of the total amount of fluid to be applied. In soils containing high amounts of clay, it is advisable to apply the total amount required in several applications. If only one or two applications are to be made on clay-containing soils, penetration and wetting can best be accomplished by disking or by mixing with a blade or both while applying the Coherex. In all cases it will be found advantageous to drag or level the area to be treated to avoid formation of puddles or run-off.

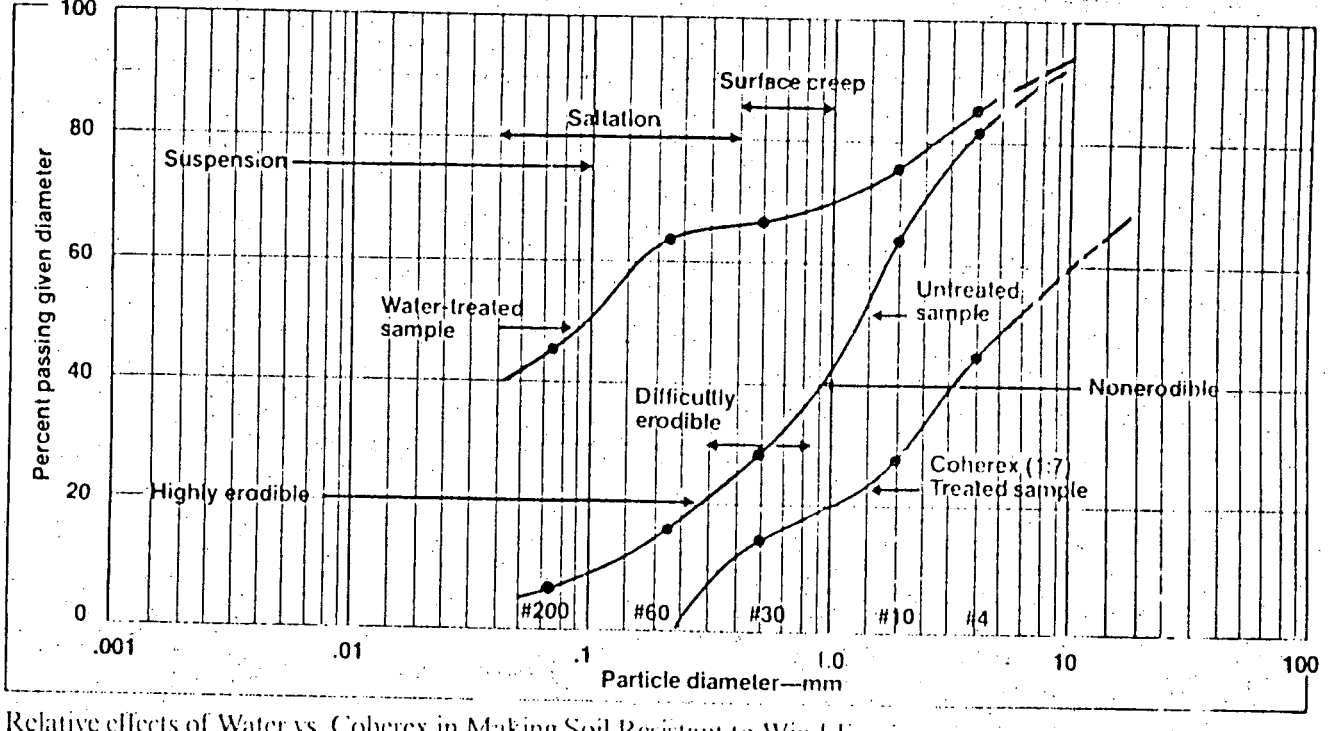
If the soil to be treated consists of loose dust more than one inch deep, the whole area should be thoroughly watered several days before application of the Coherex to create a solidly compacted subsurface and to reduce the dust layer to a thickness of about one inch. In such cases it is advantageous to add a small amount of Coherex to the water — approximately 1 part of Coherex to 20 parts of water.

The resinous particles carried into the ground by the wetting solution coat the individual soil particles with a thin film which acts as an adhesive, binding the small particles together and making them adhere to other particles. The physical and chemical properties of the resins are such that the adhesive coating formed is strongly affixed to the soil, is resistant to bacterial action and weathering, cannot be displaced by rain, and does not evaporate or percolate away.

Surprisingly enough, Coherex is even more economical to use than water, since repeated sprinkling with water alone is costly in terms of time and labor. A study made by the Materials and Research Department of the California Division of Highways showed that dust control with water alone during highway construction is very uneconomical. Water by itself is effective as a dust control agent only until it evaporates; it actually aggravates the dust condition over the long term.

Tests carried out on soils treated with water have shown that the amount of fines (dust) increases, in many cases, as much as 600 percent after the water evaporates, while in the same soils, properly treated with Coherex, the content of fines is reduced to less than 1 percent of the amount present before treatment.

The usefulness of Coherex as an effective agent for the agglomeration of dust particles is not confined to soils. Many materials which are water-insoluble, such as coal dust, can be made dust-proof.

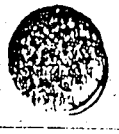


Relative effects of Water vs. Coherex in Making Soil Resistant to Wind-Erosion.

Effects of Coherex on various types of soil.

Loose sand and silt are bound together on the ground and unaffected by normal winds.

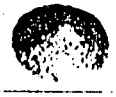
Effect of Coherex on Clay-silt soil.

Distribution of Coherex	Soil sample	Sieve analysis (percent)/particle size: +4 mesh	4-10 mesh	10-30 mesh	30-60 mesh	60-200 mesh	-200 mesh	On cohesiveness
Untreated		None	0.2	16.3	23.1	29.9	30.5	
Treated with Coherex, 1:4 dilution at rate of 1 gal. per sq. yd.		2.8	9.0	31.5	35.6	14.7	6.4	
Treated with Coherex, 1:4 dilution at rate of 1½ gals. per sq. yd.		38.0	22.7	16.8	10.7	7.0	4.8	
Treated with Coherex, 1.4 dilution at rate of 2 gals. per sq. yd.		33.8	24.0	22.3	16.7	3.2	None	

Effect of Coherex on Silty-sand soil.

Distribution of Coherex	Soil sample	Sieve analysis (percent)/particle size. +4 mesh	4-10 mesh	10-30 mesh	30-60 mesh	60-200 mesh	-200 mesh	On cohesiveness
Untreated		None	None	5.3	31.9	57.2	5.6	
Treated with Coherex, 1:4 dilution at rate of 1/2 gal. per sq. yd.		5.2	7.2	8.1	39.8	37.2	2.5	
Treated with Coherex, 1:4 dilution at rate of 1 gal. per sq. yd.		6.6	9.7	18.3	37.9	25.8	1.7	
Treated with Coherex, 1:4 dilution at rate of 1½ gals. per sq. yd.		29.3	21.3	13.3	17.2	18.0	0.9	

Effect of Coherex on Blow-sand soil.

Distribution of Coherex	Soil sample	Sieve analysis (percent)/particle size. +4 mesh	4-10 mesh	10-30 mesh	30-60 mesh	60-200 mesh	-200 mesh	On cohesiveness
Untreated		None	None	2.4	39.3	53.0	5.3	
Treated with Coherex, 1:4 dilution at rate of 1/2 gal. per sq. yd.		1.0	2.6	9.6	60.2	24.9	1.7	
Treated with Coherex, 1:4 dilution at rate of 1 gal. per sq. yd.		5.2	8.2	17.5	53.8	15.0	0.3	
Treated with Coherex, 1:4 dilution at rate of 1½ gals. per sq. yd.		23.7	18.0	24.9	32.5	0.9	None	

Coherex solves dust problems for a wide range of applications.

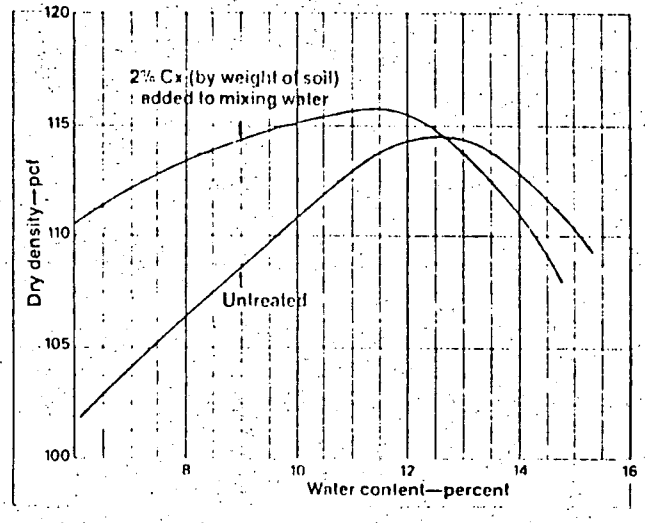
By now you have a general understanding of the way Coherex interacts with soils and conditions them by stabilization. This section of the manual will deal with the many practical applications possible with Coherex, developed by the Golden Bear Division of Witco Chemical Corporation, as the most modern and efficient dust control agent. Not only is Coherex useful in the treatment of soils, but also of ores, coal, and other matter in which dust is undesirable or where an over-all increase in particle size is desired.

The ability of Coherex to transform small particles into larger ones and to set up chain- or net-like structures makes it useful also as a soil compacting agent. Another application is its use to prevent seeds from blowing away from newly seeded areas.

Coherex can also be used in conjunction with other products. With asphalt, it can serve as a prime or tack coat; in conjunction with water-permeable membranes, it is useful as a compacting and binding agent for overlaying soil structures; as an additive to soil sterilants, it increases their effectiveness; as an additive to water used in compaction of soils, it results in increased dry density.

Coherex solves dust problems in:

Athletic fields
Auto parking lots
Airfields
Barbecue areas
Baseball parks
Bridle paths
Camps
Cemeteries
Coal preparation
Construction areas
Country clubs
Dairies
Dirt floors
Drive-in restaurants
Drive-in theatres
Driveways
Estates
Fairgrounds
Football fields
Fruit stands
Gasoline stations
Walks
Hotels
Laundries
Military centers
Orchards
Ore treatment plants
Parade grounds
Parks
Playgrounds
Polo fields
Poultry litter houses
Race tracks
Railroads
Roads
Road shoulders
Rodeo grounds
Schools
Tennis courts
Tourist camps
Unpaved areas around industrial plants
Vineyards



Coherex can be used to obtain greater compaction of problem soils than is obtainable with water alone.

General recommendations for dilution and application.

Since Coherex is a concentrate, it is always diluted with water. Application is made by sprinkling the area with an amount of the diluted concentrate sufficient to penetrate the layer of dust to whatever depth required. Spreader trucks, hand sprayers, orchard sprayers, or other standard equipment is used. For best application, spraying pressure should be approximately 25 to 30 psi.

How much water should be used to dilute Coherex?

Three concentrations have been found to be most practical for all applications:

One part Coherex to four parts water.
One part Coherex to seven parts water.
One part Coherex to ten parts water.

The ratio of dilution selected depends upon the specific application and desired results.

Depth of penetration is controlled by the total amount of fluid applied, and the thickness of the coating is controlled by the amount of Coherex concentrate in the fluid. Actual amount of concentrate in each particular case will depend on the prevailing dust conditions, anticipated traffic, and type of soil.

Under average conditions, such as those existing in parking lots and packed dirt roads, one to one-and-a-half gallons of the 1:4 dilution per square yard will do an

effective job. If accumulated loose dirt is not thicker than one-half inch and traffic is light, one gallon of the 1:7 dilution per square yard will be sufficient.

Where dust conditions are severe, such as on service roads and sandy vineyards, several applications are recommended. A one or one-and-a-half gallon per square yard application of the 1:7 dilution; followed preferably after several hours by a one gallon per square yard application of the 1:4 dilution.

In many cases, it will be advantageous to make the second application after several days, when traffic over the area has packed the dust.

When alleviating dust conditions is to be combined with packing down of an area over which a hard-surface highway is to be constructed, drenching the area with a 1:10 solution to the point of complete saturation is recommended. Under continued traffic any area will have to occasionally be retreated.

The area to be treated with Coherex should be chapped or leveled so that runoff and formation of puddles will be avoided.

The following examples may serve as further illustrations: On ball parks and playgrounds, for instance, deep penetration on a thin coating of dust particles can be obtained by drenching the ground with a highly diluted mixture. (A 1:7 dilution will immobilize the dust only, and will maintain the soft free-flowing properties of the sand.) Somewhat less penetration and a heavier coating can be obtained by using a more concentrated mixture of Coherex and water. (A 1:4 dilution applied at a lower rate will give a surface which will better withstand wear, and will bind dust blown onto the treated area.)

On dirt roads, driveways, and utility yards, with relatively thin layers of dust over hard subsurfaces, application of a more concentrated mixture in moderate amounts will produce the desired complete penetration down to the hard subsurface with a sufficiently heavy coating of the dirt particles. (A 1:4 dilution applied one-half gallon per square yard will suffice to treat a dust layer of approximately ½ inch thickness.) Re-treatment will be necessary.

On areas covered with large amounts of loose dust, which should be settled or packed down, high dilution with water is recommended. (A 1:10, or even a 1:15 dilution, of Coherex will be found advantageous in all cases where water is at present used as a temporary dust palliative or as a means of packing a road sub-surface.) It will be found that this application will save considerable time, labor and water. The highly diluted Coherex gives better penetration, better wetting, tighter packing, improved adhesion, and a reduction in rate of evaporation of the water. All of which amounts to a considerable saving of money.

Gallons of Coherex concentrate required for areas of various sizes.

Dilution		Coherex/Water 1:4.					Coherex/water 1:7.				
Rate of application of diluted mixture (gal./sq. yd.)		1/2	3/4	1	1¼	1½	1/2	3/4	1	1¼	1½
Size of Area (sq. yds.)	100	10	15	20	25	30	6	9	13	16	19
	200	20	30	40	50	60	13	19	25	31	38
	500	50	75	100	125	150	31	47	63	78	94
	1,000	100	150	200	250	300	63	94	125	156	188
	2,000	200	300	400	500	600	125	188	250	313	375
	(acre) 4,840	484	726	968	1,210	1,452	303	454	605	756	908
	5,000	500	750	1,000	1,250	1,500	313	469	625	781	938
	10,000	1,000	1,500	2,000	2,500	3,000	625	938	1,250	1,563	1,875
	20,000	2,000	3,000	4,000	5,000	6,000	1,250	1,875	2,500	3,125	3,750
	50,000	5,000	7,500	10,000	12,500	15,000	3,125	4,688	6,250	7,813	9,375

Example: An area of 20,000 sq. yds. treated at the rate of ¾ gal. per sq. yd. in 1:4 dilution will require 3,000 gals. concentrate and 12,000 gals. of water.

Coherex application, continued.

On road shoulders and farm service roads the application of a moderately concentrated mixture in high amounts is recommended. In many cases it will prove most practical to give the surface several applications.

(On ranch roads, for instance, a 1:4 dilution applied 1 gallon per square yard, followed a few days later by a one-half gallon per square yard application, will give the most satisfactory results.)

These two applications will convert dusty roads into compact road surfaces over which traffic can move at normal speeds without stirring up dust to drift onto crops. Re-treatment will usually be necessary on dirt roads.

On mine haul roads where oversize and overweight vehicles are predominant, repeated applications are the general rule. In most cases the initial applications must be repeated several times and thereafter the frequency depends on soil types, amount of traffic, spillage and atmospheric conditions. (A 1:6 dilution is recommended for the initial applications, and after the resins are built-up, the necessary re-treatments can be made with a 1:8 dilution.)

However these dilution ratios can vary to suit the existing conditions. If the conditions are such that the dilution cannot penetrate the surface of the roadway, it should be scarified to a depth of at least 1" (one inch) and then treated with the diluted Coherex so that the 1" layer is totally wetted. Traffic can then be allowed to use the facility as soon as this operation is completed. Compaction with a rubber tired roller is desirable but not necessary.

Retreatment of roads should be done only when necessary to alleviate dust, not on a regularly scheduled, routine basis. This will reduce costs and will prevent a buildup of resins which may develop an undesirable, hard, impervious surface.

At industrial complexes, several applications of a 1:4 dilution are made, normally at ½ gallon per square yard. When it becomes necessary to re-treat, light applications (one quart per square yard) of a 1:6 dilution will be sufficient. If the surface conditions are such that the initial applications do not penetrate the surface it should be scarified to a 1" (one inch) depth, treated and compacted.

On active tailing ponds at mining complexes the dilution ratios and rate of application vary considerably depending on the activity and types of soil. It is recommended that the representative soil samples be taken and tested to determine the most effective dilution and application rates to solve the specific and immediate problem.

The dilution ratios can vary from 1:4 to as high as 1:10 and application rates from 1/2 gallon to as high as 1½ gallons per square yard.

On inactive tailing ponds at mining complexes seeding is generally the approach to develop permanent dust control. This approach entails a detailed investigation of the soil to determine the nutrients and fertilizers required to support germination as well as the type of seeds best suited to the area. There are two procedures, seeding first, then spraying with a 1:4 dilution or hydroseeding. In both cases 1/4 to 3/4 gallon per square yard of a 1:4 dilution is recommended, depending on soil conditions.

Sand dunes. It is possible to stabilize dunes with a 1:4 dilution applied at rate of 1 - 2 gallon per square yard. The basic method here is to impart to sand, physical properties similar to those of wet snow; that is, creating cohesiveness between the grains of sand and thus imparting a new property to the sand. Practical results of Coherex used in this manner are retardation of shifting of the dunes, elimination of saltation, and stabilization of the soil in general, making it possible for vegetation to take hold.

As with all soil stabilization measures, however, it is important to stabilize the surrounding areas to prevent encroachment. Localized treatment can only protect stabilized soil to the extent that sand and dust are not blown off the area. Only treatment of adjacent areas will prevent dust from blowing onto it.

Liquid mulch in seeded area. The dilution used will vary according to the type of soil and the specific objective. In most cases, a 1:4 Coherex blend is applied at a rate of 3/4 gallon per square yard. If the seeded area is to germinate in six months or less, 1/2 gallon or less per square yard should be an ample application. If germination and growth are to exceed six months, 1/2 gallon or more should be used.

Coherex is also ideal for hydro-seeding techniques, whereby seeds mixed with the dilution are sprayed over the area being treated. The dilution serves to hold seeds in place and to prevent wind erosion damage to young seedlings. Coherex accelerates germination by increasing ground temperatures.

Coal and ores. As mentioned briefly at the beginning of this section, Coherex can be used to agglomerate fines in any material that is not water soluble. Tested and proven applications of this type include treatment of ores and dustproofing of coal. For example, a Coherex treatment with a 1:15 dilution, using seven gallons per ton of coal, can render the coal completely dust-free. The "Heat of Combustion" (BTU) of coal is increased when it is sprayed with Coherex.

Poultry litter houses. Dust can become a serious problem where chickens are housed on litter, especially in dry climates. Even in environmental control houses where a ventilation system exhausts moisture from the building, dust is dangerous. A number of pullet ranchers, believing that dust triggers respiratory disease outbreaks, spray the litter with the one part of Coherex to three parts of water.

Safety aspects of Coherex.

Independent laboratories have conducted tests and examinations to determine the effects of Coherex in the following areas: Oral-Toxicity, Eye Irritation, Skin Irritation, Acute Inhalation Toxicity, and Biochemical Oxygen Demand. The conclusions and results of the above individual tests were as follows:

Oral toxicity: The LD50 was found to be greater than 16 grams per kilo of body weight, and is considered to be Class 1—"Practically non-toxic"—by the oral route.

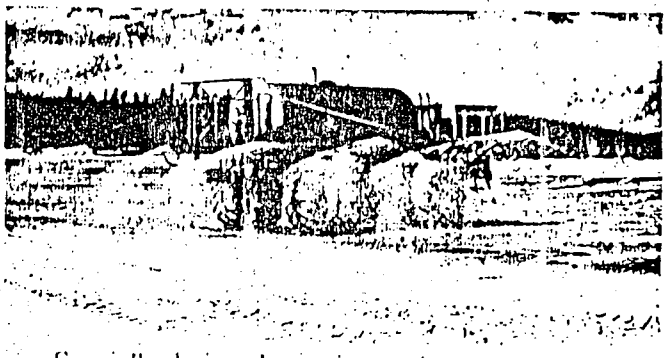
Eye irritation: In accordance with the Code of Federal Regulations, Title 16, Section 1500.3, it is not considered to be an eye irritant.

Skin irritation: In accordance with the Code of Federal Regulations, Title 16, Section 1500.3, it is not considered to be a primary skin irritant.

Acute inhalation toxicity: During the exposure to inhalation, and for a two week observation thereafter, the test animals exhibited no abnormal physical or behavioral characteristics and had normal weight gains. No anatomical abnormalities were observed. None of the animals died from the dosages.

Biochemical oxygen demand: Coherex was tested for BOD in accordance with "Standard Methods for the Examination of Water and Wastewater", 13th Edition, 1971. The results were 95 parts per million indicating that the presence of Coherex in storm runoff results in virtually no BOD increase.

Copies of the official laboratory data and results are on file and available on request.



Specially-designed spraying equipment can be developed without concern about its use with Coherex.

Gallons of Coherex concentrate required per mile.

Dilution		Coherex/water 1:4.					Coherex/water 1:7.				
Rate of application of diluted mixture (gal./sq. yd.)		1/2	3/4	1	1¼	1½	1/2	3/4	1	1¼	1½
Width of strip (in feet)	9	528	792	1,056	1,320	1,584	330	495	660	825	990
	12	704	1,056	1,408	1,760	2,112	440	660	880	1,100	1,320
	14	821	1,232	1,643	2,054	2,464	513	770	1,027	1,274	1,540
	16	939	1,408	1,877	2,347	2,816	587	880	1,173	1,467	1,760
	18	1,056	1,584	2,112	2,640	3,168	660	990	1,320	1,650	1,980
	20	1,173	1,760	2,347	2,933	3,520	733	1,100	1,467	1,833	2,200
	24	1,408	2,112	2,816	3,520	4,224	880	1,320	1,760	2,200	2,640
	30	1,760	2,640	3,520	4,400	5,280	1,100	1,650	2,200	2,750	3,300

Example: Treating a strip 20 ft. wide with Coherex diluted 1:4 at the rate of 1/2 gal. per sq. yd. will require 1,173 gals. of Coherex (plus 4692 gals. of water) per mile.

Coherex applications and case studies.

How Coherex stopped the sand storm in New York City.

Everyone knows that New York's financial district is one of the nation's busiest areas.

But few people realize that it's also one of the windiest. (Average winds at Battery Park: 14.5 mph.)

This caused an unexpected, and quite serious situation.

The City's problem.

The giant landfill for Battery Park City, the planned location for 16,000 apartments and 6 million feet of offices was begun in 1966.

The problems began after the completion of the northern landfill section. Winds blowing across the Hudson River onto the landfill's surface gave rise to swirling dust.

That's when officials, impressed by Witco's success with a similar problem at the JFK airport, turned to Coherex™ for help.

Applying Coherex to all 15 acres solved the problem, so plans for the city within a city continued.

Treatment of sand dunes at Vandenburg AFB, Lompoc, Calif.

Active and secondary sand dunes in the coastal area surrounding Vandenberg Air Force Base created a limitless source of shifting sands. A danger to personnel, facilities and equipment, the instability of the land demanded treatment to put a stop to progressive wind erosion.

Treatments with Coherex, combined with a certain amount of seeding and planting, have proven highly successful in the long term planning of sand dune stabilization at Vandenberg Air Force Base.

Controlling dust at wind-swept Kennedy Airport.

New York's Kennedy International is among the busiest commercial airports in the country. With domestic and international flights arriving and departing every few minutes, maximum visibility and safety for passengers, flight crews and personnel is a must. That is why the grounds maintenance staff at Kennedy has been using Coherex successfully for the last four years to tame the dust and grit blown up by gusty winds from neighboring Lower New York Bay. Open, sandy areas adjacent to runways and taxiways have been treated to preserve grading in these areas and to protect grass seed mixtures planted in the exposed regions. The dilution aids germination of cover foliage both by conditioning soils and by preventing wind erosion and scattering of the seed.

Coherex tackles desert at Holloman AFB.

Holloman Air Force Base in Alamogordo, New Mexico, faces a dust control problem similar to that at Vandenberg AFB. Holloman, an important Air Force Flight Test Center located in the middle of the Tularosa Basin desert region, has always been plagued by frequent wind storms that keep dry, sandy soil particles constantly on the move. Air operations were threatened too often by regular dust storms and shifting sands that cut visibility, cluttered runways and taxiways, and caused damage to equipment and buildings.

Dust control personnel at Holloman turned to Coherex more than ten years ago to aid in the fight against desert sand. Currently, Coherex is used to stabilize soil on over one million square yards, about 207 acres, of desert at Holloman annually. The dilution is sprayed around housing and recreational facilities. Shoulders and overruns of Holloman's three runways, adjacent taxiways and the shoulders of the rocket sled test track are also treated with Coherex to hold dust to an absolute minimum.

Soil Sterilization.

When delicate equipment must be kept free of pollen as well as dust, a suitable sterilant, either liquid or wettable powder, may be readily introduced into the Coherex dilution and sprayed onto the surfaces to be treated. Such applications have been necessary at many of the Minuteman missile sites installed in the north central states.

Bridger Coal does away with haulroad dust at Wyo. coal mine.

At Bridger Coal Company near Rock Springs, Wyoming, dust on haul and access roads became a serious problem after the mine began operations in mid-1974. As

traffic from 120-ton coal haulers and ash trucks built up, dust became increasingly acute and made driving hazardous. The company's Coherex dust retardant program, which went into full operation early the next year, provided a safer, cleaner environment for the truck drivers and negated the need for additional watering trucks to keep the dust down.

An additional benefit of Coherex is its ability to stabilize the soil without harming vegetation or deterring plant growth. This will be especially important when Bridger Coal returns its roadways to nature.

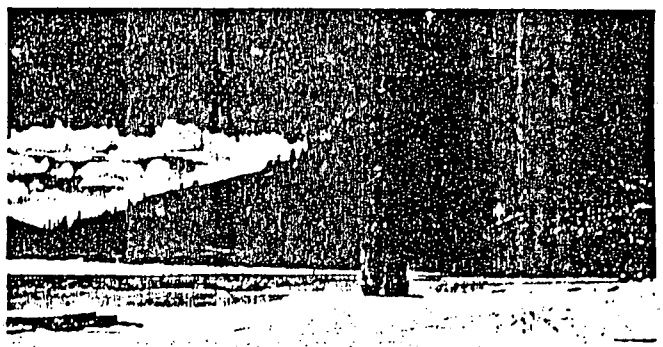
Climax Molybdenum stabilizes dust on tailing ponds and dam faces.

Climax Molybdenum Company evaluated a number of chemical agents in a search for an effective and economical way of controlling dust coming off the tailing ponds and dam faces at its mining sites in Climax, Colorado. Sloping terrain and high-altitude climatic conditions combined with cost and toxicity considerations eliminate most of the contenders. Treatments with Coherex dust retardant, mixed with waste water from Climax retention ponds, proved successful in stabilizing problem areas and have led to long-range control programs using the agent.

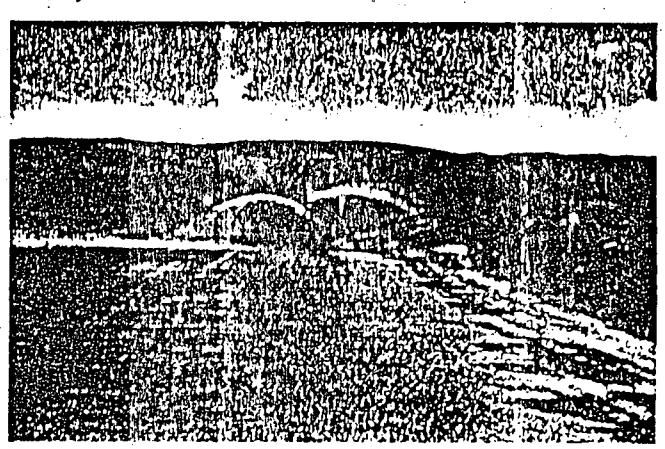
Gilmore Steel controls dust at its Oregon steel mill.

Heavy daily use of unpaved roads by all kinds of equipment produced dust and major problems for the mill of the Gilmore Steel Corporation, Portland, Oregon. Vehicles required extra attention to insure their good operating condition, and personnel discomfort was a constant concern. When the mill turned to a regular control program of Coherex dust control treatments, it not only alleviated the dust problem but it was also found that its roads developed a long-lasting, dust-free surface.

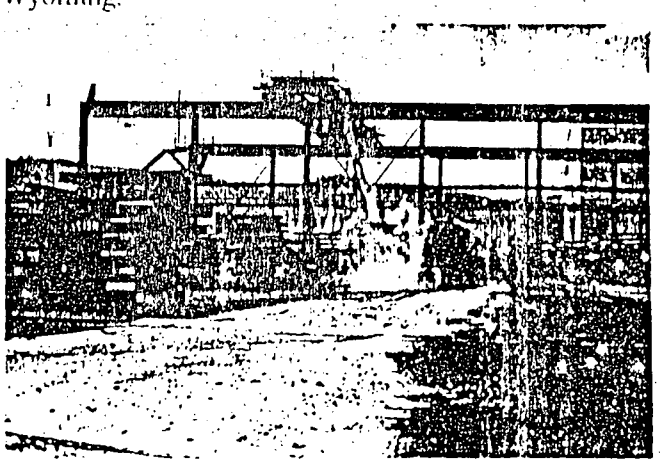
Effectiveness of the program has created a continuing demand for the dust-control services in other areas of the mill. Short of paving, say company officials, the program has brought them as closely as possible to the permanent containment of dust.



Spraying Coherex on tailing pond at Climax Molybdenum, Colorado.



Coherex being sprayed on haul road at Bridger Coal, Wyoming.



Storage yard at Gilmore Steel, Oregon being sprayed with Coherex.

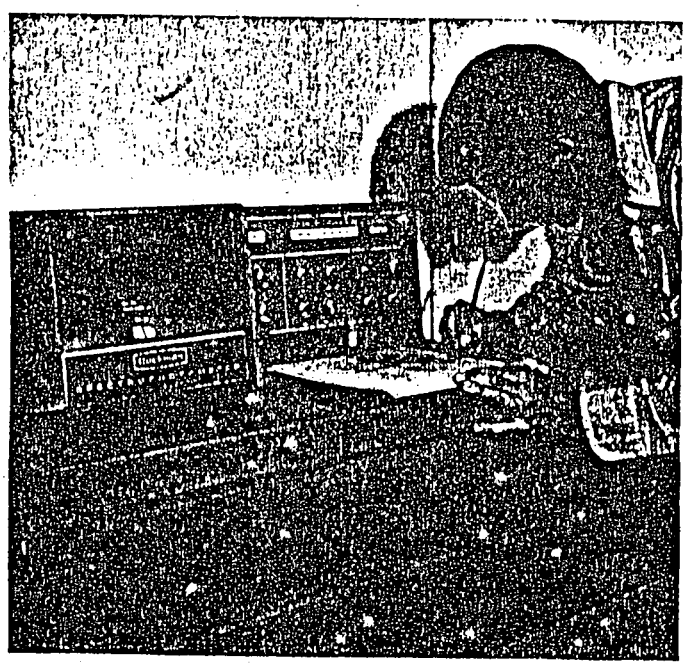
Coherex specifications from various agencies.

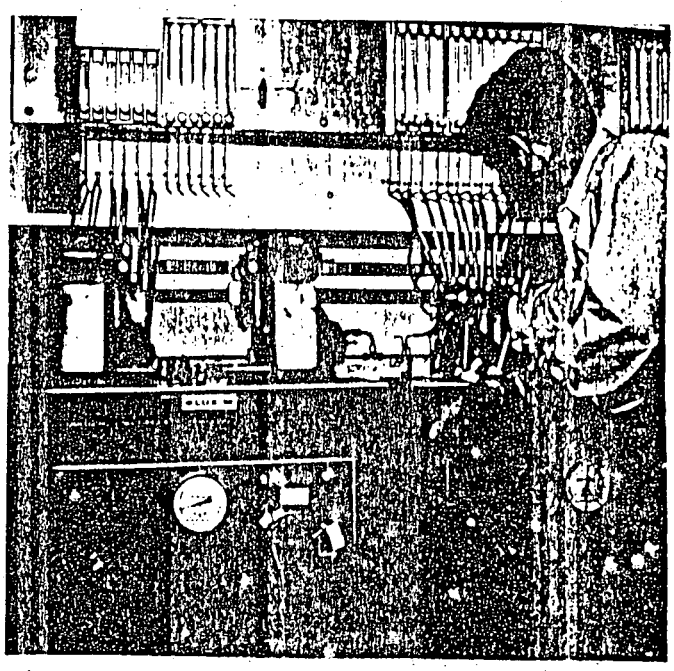
"A dust-binding preparation of light yellow color, consisting of a free-flowing, stable emulsion of 60 plus or minus 3 percent semiliquid, resinous, petroleum bodies and 40 plus or minus 3 percent water containing a suitable emulsifying agent -- the petroleum resinous bodies having a minimum flash point of 400°F and a specific gravity of 1.02 plus or minus 0.02 (at 60/60°F), and 'stable' meaning that the undiluted emulsion will not break when stored in clean, closed containers at ordinary temperatures (not exposed to freezing or boiling) for a minimum period of three months, Coherex."

"A water emulsion of semiliquid petroleum resins of 60 percent concentration, which can be diluted with water in any specified ratio and which is suitable for treating soil for agglomeration of fines, Coherex or equal."

"The dust-binder shall be a stable emulsion consisting of semiliquid petroleum resins and a wetting solution. The resins shall be the film-forming, dust-binding portion of the preparation; the wetting solution shall be the component which serves as the carrying and penetrating agent and shall keep the resins dispersed in finely divided particles, which shall make the dust-binder readily miscible with water in all proportions. Chemically, the dust-binder shall consist of natural petroleum resins, wetting agents, sequestering agents, and water. The petroleum resins, which constitute about 60 percent of the concentrate shall be non-volatile under atmospheric conditions and shall be characterized by a high affinity for soil. The wetting agent shall disperse the fine particles kept in suspension in the emulsion; shall increase the spreading power of the diluted emulsion; and shall increase the penetration of the resinous particles into soil. The sequestering agent shall make the preparation stable against hard water, thus permitting dilution of the emulsion with almost all types of water. The water content in the concentrate shall be an integral part of the preparation. The water shall be the solvent for the wetting and sequestering agents. Added water shall act as a diluent to assure economy in use and shall function as conveyor for the resinous particles of the emulsion, Coherex."

"Dust-binder shall consist of a non-flammable mixture of natural petroleum resins (60 percent of the concentrate), wetting agents and sequestering agents. The dust-binder shall be similar and equal to Coherex, manufactured by the Golden Bear Division of Witco Chemical Corporation. The dust-binder shall be diluted with water using one part binder to four parts of water and shall be thoroughly mixed prior to distribution."





The quality and uniformity of Coherex is constantly being checked and controlled in the modern Golden Bear laboratories at Bakersfield, California.

The material shall be a light yellow emulsion suitable for use as an agglomerant for soil particles. The emulsion shall contain 60 to 65 percent of a thermo-plastic resinous petroleum fraction characterized by the following properties:

Specification designation	ASTM Test method	Requirements
Viscosity @ 210° F (98.9° C), SUS	D88	90-120
Asphaltenes, percent	D2006	0.75 (max.)
Saturates, percent	D2006	20 (max.)
Flash point, COC, degrees F	D92	400 (min.)
Specific gravity	D1298	1.000-1.040

The emulsion shall be stable, i.e., should not break when stored in clean, closed containers at ordinary temperatures, excluding freezing or boiling, for a minimum of six months. It shall be miscible with water in all proportions (including a ratio of 1 part emulsion to 20 parts water). The sequestering agents shall make the preparation stable against hard water, thus permitting dilution of the emulsion with almost all types of water.

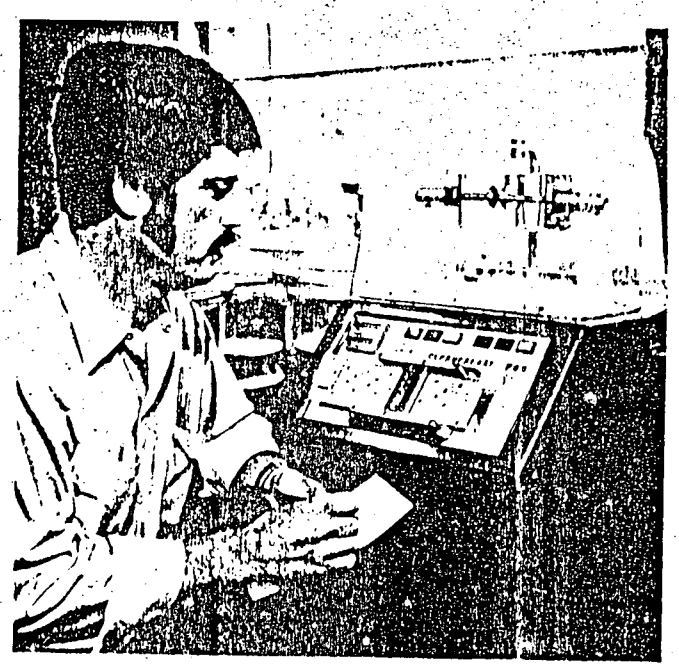
The emulsion shall be noncorrosive to metal containers. It shall be noninjurious to the growth of volunteer or seeded plants or grass. The material shall penetrate into the soil surface and not form a skin at the surface or a crusted surface.

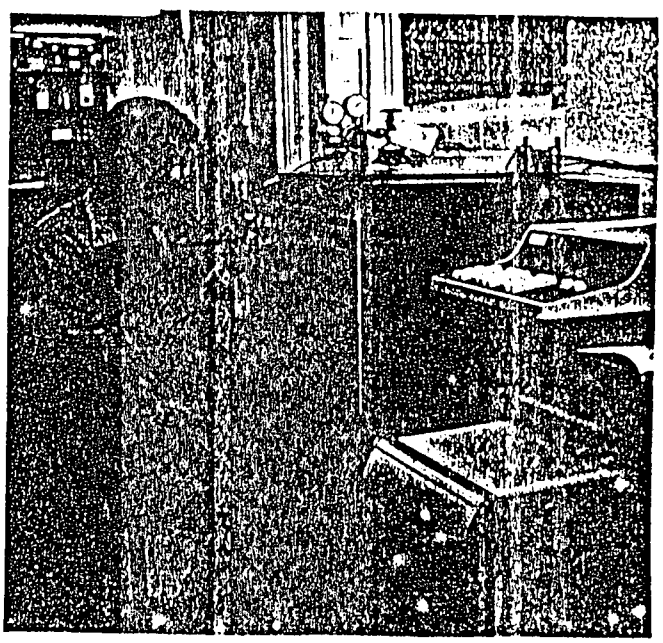
The properties of the emulsion phase for Coherex are as follows:

Specification designation	ASTM Test method	Requirements
Viscosity @ 77° F (25° C), SFS	D-244	15-40
Sieve Test, percent	D-244 (MOD)[1]	0.1 (max.)
Residue, percent	D-244 (MOD)[2]	60-65
Particle Charge Test	D-244	positive

(1) Test procedure identical with ASTM except that distilled water shall be used in place of two percent sodium oleate solution.

(2) ASTM D-244 Evaporation Test for percent of residue is modified by heating 50 gram sample to 300° F (148.9° C) until foaming ceases, the cooling immediately and calculating results.





Close analysis of all component ingredients, as well as finished product, make Coherex the finest dust control agent available.

Application checklist for using Coherex.

The three principal factors to consider before carrying out any field application of Coherex are: The area to be treated, the equipment to be used and the spreading procedure.

(1) Area Survey.

To calculate how much labor, water and Coherex will be required, determine:

(A) Size of area: For practical purposes, figure in square yards.

(B) Soil texture: Note whether the soil is porous such as sand, or tight such as adobe or gumbo clays.

(C) Amount of fluid required per square yard: Estimate on the basis of soil type, traffic to be expected, and effect desired.

(D) Accessibility of water: (1) Distance to nearest water supply, (2) size of outlets for water connections, and (3) type of hose connection.

(E) Topography: Is the terrain rough or smooth? (Hilly terrain will require several passes with the truck for application of the full amount of fluid to avoid loss from runoff.)

(F) Location of job: Information on accessibility will be needed to figure transportation to and from the job and time required for bringing the concentrate to the job. For large-scale application, railroad facilities should be investigated for shipping the concentrate in tank cars.

(2) Equipment.

The principal items of equipment required are:

(A) Storage facilities: Large amounts to be used in one particular area, or for a large-scale job, should be stored in a clean storage tank with proper outlets for pumping the concentrate into the spreader truck. For jobs to be carried out over a short time, the concentrate may be stored in tank cars if siding is available nearby. For smaller jobs or extended but intermittent operations, trucks and trailers can be used for both transport of the concentrate and for short-term storage. Two- or three-compartment tanks are preferable to one-compartment equipment.

(B) Spreader trucks: Except for unusually difficult terrain, any conventional oil distributor can be used, but the following features will greatly facilitate operations:

(1) For a two-axle truck not less than 8, and for a three-axle truck not less than 10 forward speeds.

(2) An auxiliary transmission, since traveling speed, pump pressure and r.p.m. on engine will differ for various applications.

(3) A power take-off with two speeds forward and one reverse.

(4) A two- or three-compartment tank. (A tank design, which experience has shown to be satisfactory in most cases, consists of a three-compartment 2000-gallon tank, with 420-gallon compartments on each end and an 1160-gallon compartment in the middle. The two end compartments are for concentrate and the middle compartment for mixing. The middle compartment should have a bottom inlet, an outlet and proper piping for circulation. Calibration of the individual compartments has been found to be a great convenience.)

(5) A pump with capacity exceeding 100 gallons per minute and driven by a shaft from the power take-off. (Chain drive should be avoided.)

(6) A spreader bar assembly consisting of 2 in. (minimum) I.D. pipe equipped with 1/2 or 3/4 in. gas cocks, spaced 4 or 6 in. apart. (The gas cocks should be equipped for simultaneous opening and closing and should be provided with individual control levers on each cock, which may be engaged or disengaged as desired to vary width of spread. The bar should be fully circulating, tilted out from the back of the truck about 80 degrees, and be vertically adjustable so it may be raised or lowered as needed. The fluid should enter both ends of the bar to insure even pressure on all nozzles.)

(7) A mechanical device (operated by hand, air or vacuum) permitting the valves to be closed or opened from the cab.

(8) A hand-operated spring by-pass valve and a pressure gauge, both to be operated from the cab.

(9) Two sets of suitable spray tips. (Large tips, 1/2 in. I.D., orifice 7/8 in. long with 1/8 in. slots cut with Woodruff key cutter. Small tips 3/8 in. I.D., orifice 9/16 in. long, slot 1/8 in. Tips should either have 1/2 or 3/4 in. standard pipe threads to fit connections.)

(C) Hand-spray tools.

(1) One or more 50 ft. hose sections (1 or 3/4 in. I.C.), capable of withstanding 80-psi pressure.

(2) Attachable pipe with spray tips and quick acting valve.

(3) A hose reel installed on the rear of the truck.

(3) Spreading procedure.

This final phase of the field application consists of:

(A) Preparing the ground: In preparing the soil for treatment, hard spots, if any, should be loosened to a depth of 1/2 in. to 1 in., so fluid will penetrate where applied; and the soil, if uneven, should be smoothed to avoid puddles.

(B) Diluting the Coherex concentrate: In the diluting process, the concentrate should be pumped into the tank before adding water. To avoid foaming, water should be pumped from a bottom inlet into the concentrate or, when it is necessary to fill from the top, the hose or pipe end should be lowered into the fluid.

(C) Actual spreading: When applying the diluted mixture to the soil, the spray bar should be lowered close to the ground, especially when dust is deep and large amounts of fluid are to be applied. In order to avoid puddling, tracking or waste, the soil should not be treated beyond the saturation point. When treating large, geometrically irregular areas, it is advisable to spray the outside borders of the area first. Planning an appropriate spreading pattern before starting work will eliminate unnecessary hand spraying and minimize overlaps, a frequent cause of job miscalculation.

Precautions: A few additional precautions worth observing are to have an extra man available to guide the truck driver and to immediately wash off with water any material accidentally sprayed on vegetation. If buildings or other structures are accidentally sprayed, wash area with water, then wipe with a rag wetted with a petroleum solvent.

Coherex being sprayed on a haul road at a mining complex to alleviate fugitive dust.

Note of caution: Detailed treating instructions are available, and should be consulted to assure proper application. Under no circumstances should COHEREX be applied in its concentrated form. It must always be used in diluated form in accordance with recommended dilution ratios for specific applications.

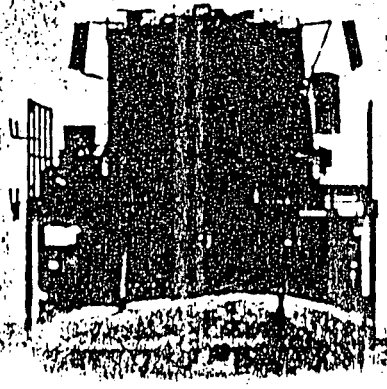
Golden Bear Division

Witco Chemical Corporation
P.O. Box 378, Bakersfield, California 93302
(805) 393-7110

East of the Mississippi:
Pioneer Division, Witco Chemical Corporation
802 Ash Street, Lawrenceville, Illinois 62439
(800) 851-5741

International:
International Chemical Marketing
Witco Chemical Corporation
277 Park Avenue, New York, NY 10017
Telephone: (212) 872-4200
Telex: ITT-422-186 RCA-233348 Western Union-624-70

In Canada:
Witco Chemical Canada Limited
2200 Yonge Street
Toronto, Ontario M4P 1B1
Telephone: (416) 484-4092



Witco Chemical

Pioneer Division

COMPILATION OF COHEREX FACTS 3-15-78

1. Sulfur in Coherex resin is present as a nonreactive organic molecule, probably as a side-chain. The amount of sulfur in a gallon of Coherex emulsion is 0.55% based on total weight.

2. Semi-quantitative analysis of a production run of Coherex, 8/5/75:

PPM	PPM	PPM
Si - 7.6	Mn - 0.21	Pb - less than 0.20
Na - 60.0	Ni - 3.0	Zn - less than 0.40
Ca - 13.0	Al - 1.1	Ti - less than 0.03
Mg - 10.0	V - 0.17	K - less than 3.0
Fe - 4.0	Li - 2.4	Sr - less than 0.03
B - 0.11	Cu - 0.27	Cr - less than 0.03
	Ag - 0.011	Cd - less than 0.08
		Other elements - nil
		Loss on ignition - 99.9673%

3. When GLYCERIN is added to Coherex Concentrate at the rate of 0.25%, or 1 quart per 100 gallons of Coherex, it acts as a freeze-thaw stabilizer (NOT AN ANTI-FREEZE) to the emulsion, and it will protect the concentrated emulsion through 10 or more freeze-thaw cycles.

4. HALOGENS, if present in Coherex, are in such insignificant quantities that they cannot be measured.

5. Coherex resin is very substantive to soils; and, if accidentally spilled in a river or pond, it would quickly plate out to the sides and bottom.

6. The emulsifier used in Coherex is biodegradable.

7. Concentrated Coherex emulsion has approximately 145,000 B.T.U.'s per gal.

8. At one gallon per square yard on a coal slurry, dried and ground to its most extreme condition:

   1:10 dilution protects in wind to 35 mph.
   1:7 dilution protects in wind to 50 mph.
   1:4 dilution protects in wind to 55 mph.
   1:1 or 1:2 dilution is effective against wind velocities of 70-80 mph, when applied at the rate of 1-1½ gallons per square yard.

SALES OFFICE: 802 Ash Street • Lawrenceville, Illinois 62439

Chemical MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form LSB-00S-4)

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act of 1970 and shall not be used for any other purpose. Use or dissemination of all or any part of this information for any other purpose or purposes is illegal.

PRODUCT COHEREX

PRODUCT SECTION I

MANUFACTURER'S NAME: GOLDEN BEAR DIVISION, WITCO CHEMICAL CORP	EMERGENCY TELEPHONE NO.: 805 - 399-9501
ADDRESS (NUMBER, STREET, CITY, STATE, AND ZIP CODE): P O BOX 5446, OILDALE, CA. 93308	
CHEMICAL NAME AND SYNONYMS:	TRADE NAME AND SYNONYMS:
CHEMICAL FAMILY: HYDROCARBONS	FORMULA: C_xH_y

SECTION II HAZARDOUS INGREDIENTS

INGREDIENT	%	TLV (UNITS)	INGREDIENT	%	TLV (UNITS)
PRODUCT NOT HAZARDOUS AS DEFINED BY U S DEPARTMENT OF LABOR REGULATIONS.					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (UNITS)
NA		

SECTION III – PHYSICAL DATA

BOILING POINT (°F.) INITIAL, 10mm Hg	320	SPECIFIC GRAVITY (H_2O = 1)	1.01
VAPOR PRESSURE (mm Hg.) 70° F	nil	PERCENT VOLATILE BY VOLUME (%)	nil
VAPOR DENSITY (AIR = 1) 70° F	nil	EVAPORATION RATE (= 1)	nil
SOLUBILITY IN WATER PRODUCT IS AN EMULSION -- MISCIBLE WITH WATER IN ALL PROPORTIONS			
APPEARANCE AND ODOR LIGHT YELLOW COLOR - LITTLE ODOR			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) COC -- 400° F MIN.	FLAMMABLE LIMITS NA	LEL	UEL

EXTINGUISHING MEDIA

FOAM, CARBON DIOXIDE, DRY CHEMICAL, WATER FOG

SPECIAL FIRE FIGHTING PROCEDURES

STANDARD PETROLEUM PROCEDURES

UNUSUAL FIRE AND EXPLOSION HAZARDS

NONE

Attn: Mr. Harrel

OCULAR REACTION GRADING SCALE

		Grading Scale
Cornea	No ulceration or opacity	0
	Scattered or diffuse areas of opacity (other than slight dulling of normal luster), details of iris clearly visible.	(1)*
	Easily discernible translucent areas, details of iris slightly obscured.	2
	Nacreous areas, no detail of iris visible, size of pupil barely discernible.	3
	Complete corneal opacity, iris not discernible.	4
Iris	Normal	0
	Markedly deepened folds, congestion, swelling, moderate circumcorneal injection (any of these or combination of any thereof), iris still reacts to light (sluggish reaction is positive).	(1)*
	No reaction to light, hemorrhage, gross destruction (any or all of these).	2
Conjunctivae	Redness (Refers to palpebral and bulbar conjunctivae excluding cornea and iris)	
	Vessels normal	0
	Some vessels definitely injected.	1
	Diffuse, crimson red, individual vessels not easily discernible.	(2)*
	Diffuse beefy red.	3
	Chemosis	
	No swelling	0
	Any swelling above normal (includes nictitating membrane).	1
	Obvious swelling with partial eversion of lids.	(2)*
	Swelling with lids about half closed.	3
	Swelling with lids more than half closed.	4

* Bracketed figures indicate lowest grades considered positive under Section 191.12 of the Federal Hazardous Substances Labeling Act Regulations.

Wilco Chemical Corp.

Attn: Mr. Harrel

Test Report No. 1-5-6261-6
P. O. No. 63-1702
Date Received: 4-06-76
Date Initiated: 4-08-76
Date Completed: 4-13-76

Specimen Description: One (1) one-gallon metal can, SS-2559, filled with a thick tan colored liquid described as a water-oil emulsion.

Type of Examination: ASSAY FOR BIOCHEMICAL OXYGEN DEMAND

Reference: Standard Methods for the Examination of Water and Wastewater, 13th Ed., 1971.

Results:

Analyte	BTP No.	Parts per million (mg/l)
Biochemical Oxygen Demand	5-2-013-71	95

Examination by: Daniel T. Earl
Daniel T. Earl, B.S., Chemist

Approved by: Bong Ja Lee
Bong Ja Lee, M.S.V. Chemist
Chemistry Team Leader

sj

APPLIED BIOLOGICAL SCIENCES LABORATORY

RESEARCH • DEVELOPMENT

6320 SAN FERNANDO ROAD • GLENDALE 1, CALIFORNIA • CITRUS 2-6944

Sample: SS-2559A (RFS-8422)

Date: 10/29/76

Submitted By: Witco Chemical
P.O. Box 5446
Bakersfield, California - 93308

Received: 8/27/76

Subject: Acute Inhalation Toxicity

Laboratory No. 11423

REPORT

Procedure: Ten male albino rats, Sprague Strain, weighing between 200-300 grams were exposed in an inhaltion chamber for a duration of 1 hour for each concentration of product. During the exposure, the animals were observed for abnormal behavioral and physical characteristics. At the termination of the exposure the animals were again observed for abnormal characteristics in their normal environment. The animals were then observed for a two week observation period after which the animals were sacrificed and autopsied for gross anatomical dysfunctions.

Results:

Initial Weight	Dosage	exposure	Weight at 14 days or death
275 gm	31,000 ppm	1 hour	352 gms
298 gms			395 gms
297 gms			403 gms
292 gms			364 gms
289 gms			350 gms
295 gms	31,000 ppm	1 hour	373 gms
294 gms			366 gms
280 gms			349 gms
300 gms			388 gms
232 gms			329 gms

Avg. wt. gain = +81.7 gms

SS-2559A

Results con't:	Initial Weight	Dosage	Exposure	Weight at 14 days or death
	268 gms	881 ppm	1 hour	381 gms
	272 gms			360 gms
	270 gms			348 gms
	262 gms			371 gms
	285 gms			358 gms
	288 gms	881 ppm	1 hour	369 gms
	271 gms			391 gms
	263 gms			400 gms
	265 gms			370 gms
	281 gms			350 gms

Avg. wt. gain = 97.3 gms

Conclusion: During the exposure for each concentration of product there were no abnormal physical or behavioral characteristics observed other than a licking reflex that arose from a condensate that formed on the animals fur. Following the two week observation period the animals exhibited normal weight gains and there were no anatomical abnormalities observed grossly. None of the animals died at either dosage.

Respectfully submitted,

APPLIED BIOLOGICAL SCIENCES LABORATORY

J.B. Michaelson

J.B. Michaelson, Ph.D.
Director

SECTION V HEALTH HAZARD DATA

#1900

THRESHOLD LIMIT VALUE

OBSERVE CURRENT ACGIH TLV OF 5 MG/M^3 FOG OIL MISTS

EFFECTS OF OVEREXPOSURE

DERMATITIS MAY BE ENCOUNTERED IN VERY SENSITIVE INDIVIDUALS AFTER EXTENDED EXPOSU

EMERGENCY AND FIRST AID PROCEDURES

SKIN CONTACT SHOULD BE AVOIDED. IF CONTACT DOES OCCUR, WASH THOROUGHLY WITH SOAP / WATER. IF INADVERTENTLY INGESTED, ADMINISTER VEGETABLE OIL. THE STOMACH SHOULD B EMPTIED BY VOMITING OR OTHER MEANS, CARE BEING TAKEN AGAINST ASPIRATION. CALL A PHYSICIAN. EYE CONTROL -- WASH WITH LARGE QUANTITIES OF WATER.

SECTION VI REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		AVOID EXPOSING MISTS OR SPRAYS TO HIGH TEMPERAT
	STABLE	X	OR OPEN FLAMES.

INCOMPATABILITY (MATERIALS TO AVOID)

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

WASH WITH SOAP AND WATER OR DETERGENT AND WATER. REMOVE WITH ABSORBENT MATERIAL SUCH AS SAND, CLAY, ETC.

WASTE DISPOSAL METHOD

ABSORPTION OR CONTROLLED BURNING. LOCAL, STATE, AND FEDERAL REGULATIONS SHOULD BE OBSERVED.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE)

NOT REQUIRED.

PROTECTIVE GLOVES

USE OF OIL RESISTANT GLOVES DESIRABLE

EYE PROTECTION

SAFETY GLASSES USEFUL, BUT NOT REQUIRED

VENTILATION		SPECIAL
	LOCAL EXHAUST: LOCAL VENTILATION SHOULD BE USED AS NEE	DED
	MECHANICAL (GENERAL)	OTHER: NONE

OTHER PROTECTIVE EQUIPMENT

BARRIER CREAMS CAN BE USED FOR SENSITIVE INDIVIDUALS.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

PETROLEUM OILS ARE RELATIVELY NON-VOLATILE PRODUCTS AND DO NOT PRESENT VAPOR HAZARD AT 70°F.

OTHER PRECAUTIONS

Date Issued 8/1/77 Supplier's Signature Dan E. Nicholson

Title TECHNICAL COORDINATOR Company GOLDEN BEAR DIVISION WITCO CHEMICAL CORP. 10100 SANTA MONICA BLVD. LOS ANGELES, CA 90067

RETURN TO

Name

Company

LABORATORY CERTIFICATE NO. 760973

DATE RECEIVED: 4-6-76
DATE INITIATED: 4-8-76
DATE COMPLETED: 4-22-76

TEST REPORT NO.: 1-5-6261-2,4,5
PURCHASE ORDER NO. 63-1702
PAGE 1 OF 10

FOR: Witco Chemical Corporation
Golden Bear Division
P. O. Box 5446
Oildale, California 93308

Attn: Norman A. Klemp
Group Leader - R&D

SPECIMEN: One (1) gallon SS-2559, oil-in-water, emulsion brown, opaque liquid.

EXAMINATION:

STATE OF CALIFORNIA
COUNTY OF LOS ANGELES

R. J. Schlesinger, Ph. D., Director

being duly sworn, deposes and says that the information contained in this report is the result of complete and carefully conducted tests, and is to the best of his knowledge and belief true and correct in all respects.

OFFICIAL SEAL
SYLVIA MUCHNICK
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
My Commission Expires Aug. 27, 1977

R. J. Schlesinger, Ph.D.
Signature

SUBSCRIBED and sworn to before me this 11th day of May, 1976

Sylvia Muchnick
Notary Public in and for the County of Los Angeles
State of California

Attn: Mr. Harrel

Test Report No. 1-5-6261-2
P. O. No. 63-1702
Date Received: 4-06-76
Date Initiated: 4-08-76
Date Completed: 4-22-76

Specimen Description: One (1) gallon SS-2559, oil-in-water emulsion, brown, opaque liqui

Type of Examination: ACUTE ORAL TOXICITY - DETERMINATION OF LD_{50}

Reference: BTP-3-3-040-72, Turner, R. A. (1965), Screening Methods in Pharmacology, Academic Press, N.Y. and London, pp. 302-304 and 60-62. Bliss, C.I. (1938), The Determination of the Dosage-Mortality Curve from Small Numbers, pp. 192-216. Litchfield, J. T., Jr., and F. Wilcoxen (1948), A Simplified Method of Evaluating Dose-Effect Experiments. The Code of Federal Regulations, Title 16, Section 1500.3. Gleason, Gosselin, Hodge, and Smith, Clinical Toxicology of Commercial Products, 3rd Edition.

Procedure:

1) Ten (1) rats of the Wistar strain were fed at 16g/kg.
2) Rats were fed test sample by intubation.
3) The rats were then allowed to eat a balanced rat pellet diet and water ad libitum.
4) Rats were observed daily for fourteen (14) days and final weights were recorded.
*5) The percentage of dead rats at each dose level was determined and a graph was plotted of the probits (probability units) corresponding to the percentage of dead versus the logarithm of the dose.
*6) The best fitting line was determined using the linear curve equation:

$$m = \frac{(x_i - \bar{x})\ (y_i - \bar{y})}{(x_i - \bar{x})^2} \qquad b = \bar{y} - m\bar{x}$$

m = slope, b = y intercept, x_i = ith log dose, y = ith probit

*7) The dose at which 50% mortality would occur was determined from the computer using the probit of 5.0.
*8) The standard deviation (s) was determined from the relationship: the dosage interval between probits 4.0 and 6.0 is equal to 2s.

* Steps not necessary because rats survived at 16g/kg.

Results:

TABLE I

Group-I-16g/kg Dosage

Rat No.	Initial Weight (gm)	Dosage (gm)	Date Fed	Final Weight (gm)	Completion date or expiration date
1	269	4.30	4/08/76	295	4/22/76
2	275	4.40	4/08/76	278	4/22/76
3	256	4.10	4/08/76	249	4/22/76
4	300	4.80	4/08/76	295	4/22/76
5	278	4.45	4/08/76	-	4/20/76
6	249	3.98	4/08/76	-	4/13/76
7	280	4.48	4/08/76	265	4/22/76
8	260	4.16	4/08/76	241	4/22/76
9	300	4.80	4/08/76	300	4/22/76
10	250	4.00	4/08/76	265	4/22/76

Results: (Continued) Eight (8) of the ten (10) rats subjected to a dosage of 16g/kg body weight survived the fourteen (14) day observation period.

Conclusion: From the results of the testing and in accordance with the above cited documents, the sample is considered to have a 50% mortality rate (LD_{50}) of greater than 16g/kg of body weight and is considered to be Class 1- "Practically non-toxic" - by the oral route.

Examination by: William A. Kehoe Jr.
William A. Kehoe, Jr., B. A., Biologist

Approved by: William P. Jansen
William P. Jansen, Ph. D. 5-04-76
Chairman, Microbiology/Biology

sj

Wyco Chemical Corp.

Attn: Mr. Harvel

P. O. No. 63-1702
Date Received: 4-06-76
Date Initiated: 4-15-76
Date Completed: 4-18-76

Specimen Description: One (1) gallon SS-2559, oil-in-water emulsion, brown, opaque liquid.

Type of Examination: PRIMARY DERMAL IRRITANTS

Reference: BTP-3-3-004-75 in accordance with The Code of Federal Regulations, Title 16, Section 1500.41.

Procedure:

1) Six (6) young New Zealand rabbits were employed for the test samples. The dorsal area was clipped free of hair. A portion of the exposed skin was abraded and the balance left intact.
2) The sample (0.5 ml or 0.5 gram) was applied directly to the exposed skin of each animal, which was then covered with a gauze square. A plastic wrap sleeve was securely taped and wrapped around the animal. The animals were immobilized in stocks for an exposure period of twenty-four (24) hours.
3) At the end of twenty-four (24) hours, the bandages were removed and the sample washed from the skin. The animals were examined and reaction evaluated at twenty-four (24), and seventy-two (72) hours.

Results:

TABLE I

Dermal Responses of Test Rabbits

Rabbit No.	Skin	Erythema-Eschar Obser. 24 Hrs.	Erythema-Eschar Obser. 72 Hrs.	Edema Observation 24 Hrs.	Edema Observation 72 Hrs.
1	Intact	1	0	2	1
	Abraded	1	0	2	1
2	Intact	1	0	0	0
	Abraded	1	0	0	0
3	Intact	1	2	0	0
	Abraded	1	2	0	0
4	Intact	2	2	1	1
	Abraded	2	2	1	1
5	Intact	1	0	0	0
	Abraded	1	0	0	0
6	Intact	1	0	0	0
	Abraded	1	0	0	0
	Intact Value:	1	1	0	0
	Abraded Value:	1	1	0	0

Primary Irritation score: 1.0

Attn: Mr. Harrel

Results: (Continued)

1) Slight to moderate erythema-eschar formation was observed in all six (6) test animals.

2) Slight edema was observed in one (1) test rabbit; moderate edema was in evidence in one other test animal. All others exhibited no edema.

Conclusion: From the test results and in accordance with the above cited documents, Wilco Chemical Corp. sample as described above is not considered to be a primary dermal irritant.

Examination by: Terry L. Brown

Terry L. Brown, B.A., Biologist
Biology Testing Section Team Leader

Approved by: William P. Dawson

William P. Dawson, Ph.D. 4-04-76
Chairman, Microbiology/Biology

sj

Attn: Mr. Harrel

DERMAL REACTION GRADING SCALE

Skin reaction	Value[1]
Erythema and eschar formation:	
No erythema	0
Very slight erythema (barely perceptible)	1
Well-defined erythema	2
Moderate to severe erythema	3
Severe erythema (beet redness) to slight eschar formation (injuries in depth)	4
Edema formation:	
No edema	0
Very slight edema (barely perceptible)	1
Slight edema (edges of area well-defined by definite raising)	2
Moderate edema (raised approximately 1 millimeter)	3
Severe edema (raised more than 1 millimeter and extending beyond the area of exposure)	4

1) The "value" recorded for each reading is the average value of the six animals subject to the test.

Mico Chemical Corp.

Attn: Mr. Harrel

Test Report No. 1-5-6261-5
P. O. No. 63-1702
Date Received: 4-06-76
Date Initiated: 4-07-76
Date Completed: 4-10-76

Specimen Description: One (1) gallon SS-2559, oil-in-water emulsion, brown, opaque liquid.

Type of Examination: EYE IRRITATION

Reference: BTP-3-3-022-73 in accordance with The Code of Federal Regulations, Title 16, Section 1500.3.

Procedure:

1) The eyes of young New Zealand rabbits were examined and six (6) chosen who exhibited no eye defects or irritation.
2) An 0.1 (gm or ml) portion of sample was deposited into the left eye of each rabbit. The lids were held together for approximately one (1) second. The untreated right eye served as a control.
3) Eyes were examined and the grade of ocular reaction was recorded at twenty-four (24), forty-eight (48) and seventy-two (72) hours. Ocular reaction was graded according to the Food and Drug Administration Illustrated Guide.

Results:

TABLE I

OCULAR REACTION TO TEST SAMPLE

24 Hours	Rabbit No.	Cornea	Iris	Conjunctiva Redness	Conjunctiva Chemosis
24 Hours	1	0	0	1	1
	2	0	0	1	1
	3	0	0	1	3
	4	0	0	1	1
	5	0	0	1	1
	6	0	0	1	1
48 Hours	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	1
	4	0	0	0	0
	5	0	0	0	0
	6	0	0	0	0
72 Hours	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	1
	4	0	0	0	0
	5	0	0	0	0
	6	0	0	0	0

Results:
(Continued)

1) All six (6) test animals exhibited slight conjunctival redness at the twenty-four (24) hour reading which vanished by the forty-eight (48) hour reading.
2) Five (5) rabbits exhibited slight chemosis at the initial read but none was evidenced in the subsequent readings.
3) One (1) rabbit exhibited marked chemosis which subsided to chemosis by the forty-eight (48) hour reading.

Conclusion:

From the test results and in accordance with the above cited documents, Wilco Chemical Corp. sample as described above is not considered to be an eye irritant.

Examination by: Terry L. Brown
Terry L. Brown, B.A., Biologist
Biology Testing Section Team Leader

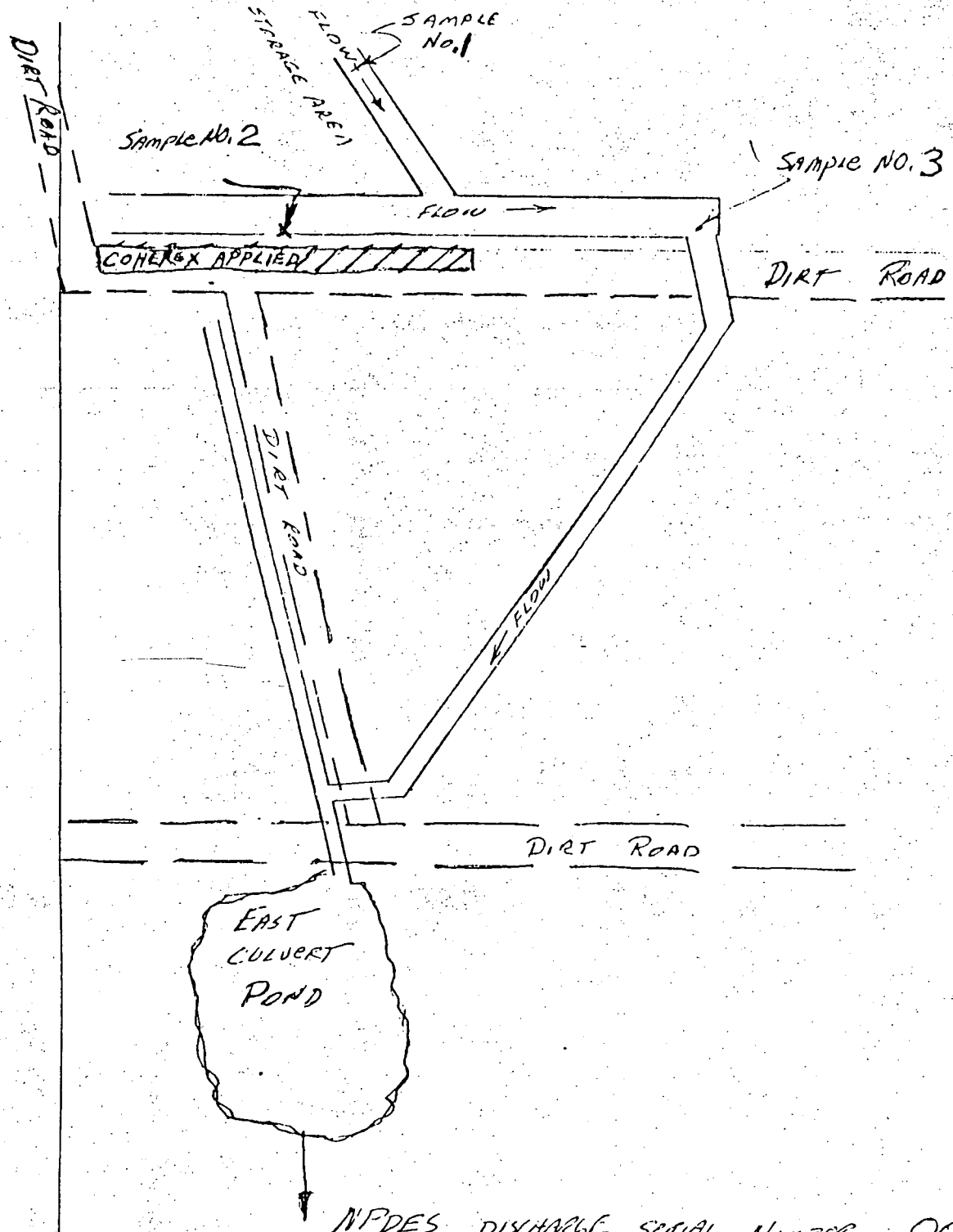
Approved by:
William P. Jansen, Ph.D. 4-04-76
Chairman, Microbiology/Biology

sj

ENCLOSURE 2

ATTACHMENT 2

LOCATION MAP



NPDES DISCHARGE SERIAL NUMBER 004

ENCLOSURE 3

ATTACHMENT 3

"COHEREX" DATA

Parameter (mg/l)	Concentrated Coherex[a]	1:4 Dilution Coherex[b]	Raw river water[c]	Sample No.1	Sample No.2	Sample No.3	Tentative effluent limitations[d]	Water quality criteria[e]
BOD_5	95[f]	20.0	1.1	<1.0	>6.0	>6.0	-	-
COD	-	-	5.5	5.0	2000	330	-	-
TOC	-	-	2.4	3.8	90.0	50.0	-	-
Mg	10.0	5.4	4.3	12	150	39	-	-
K	<3.0	<1.6	1.3	0.81	17	5.6	-	-
Fe	4.0	1.2	0.44	0.28	83	19	3.0[g]	-
O+G	-	-	-	<5.0	23	8.0	10.0	-
Zn	<0.40	<0.11	0.034	0.030	2.8	0.71	0.8	0.22
Ni	3.0	0.63	0.043	0.14	<0.050	<0.050	0.5	1.3
Pb	<0.20	0.050[h]	0.012[h]	0.006	0.16	0.046	0.1	0.102
Si	7.6	6.6[h]	6.4[h]	-	-	-	-	-
Na	60.0	17	5.7	-	-	-	-	-
Ca	13.0	17	18.5	-	-	-	-	-
B	0.11	0.102	0.10	-	-	-	-	-
Mn	0.21	0.085	0.054	-	-	-	-	-
Al	1.1	0.600	0.47	-	-	-	5.0[g]	-
V	0.17	-	-	-	-	-	-	-
Li	2.4	<0.500	<0.010	-	-	-	-	-
Cu	0.27	0.083	0.036	-	-	-	0.5	0.015

ATTACHMENT 3 (Continued)

"COHEREX" DATA

Parameter (mg/l)	Concentrated Coherex[a]	1:4 Dilution Coherex[b]	Raw river water[c]	Sample No.1	Sample No.2	Sample No.3	Tentative effluent limitations[d]	Water quality criteria[e]
Ag	0.011	<0.010	<0.010	-	-	-	0.1	0.002
Ti	<0.03	<0.81	<1.0	-	-	-	-	-
Sr	<0.03	-	-	-	-	-	-	-
Cr	<0.03	<0.010	0.005	-	-	-	0.5	2.9
Cd	<0.08	<0.017	<0.001	-	-	-	0.1	0.002

a. Semiquantitative analysis of a production run of Coherex, Witco Chemical, Pioneer Division, August 5, 1975.

b. Calculation based upon dilution of concentrated Coherex with four parts river water (see footnotes c and h below).

c. Mean river water concentrations from "Bellefonte Nuclear Plant: Preoperational Aquatic Monitoring Report," TVA, October 1980, Tennessee River Mile 391.2.

d. Alabama Water Improvement Commission, Tentative Guidelines for Effluent Limitations. Verbal communication from Ed Hughes, AWIC, Industrial Waste Section, July 27, 1979.

e. Water Quality Criteria Documents; Availability. Federal Register, vol. 45, No. 231, Friday, November 28, 1980, pages 79318-79341. Instantaneous maximum concentration for protection of fresh water aquatic life using a hardness as $CaCO_3$ of 65 mg/l (mean value from "Bellefonte Nuclear Plant: Preoperational Aquatic Monitoring Report," TVA, October 1980).

f. Assay for Biochemical Oxygen Demand, Bio-Technics Laboratories, Inc., Los Angeles, California, April 13, 1976.

g. Dissolved metals concentration.

h. Mean river water concentration from "Bellefonte Nuclear Plant: Preoperational Aquatic Monitoring Report," TVA, October 1980, Tennessee River Mile 388.0.

Enclosure 2

STATE OF ALABAMA

WATER IMPROVEMENT COMMISSION

April 23, 1981

Mr. Mohamed T. El-Ashry
Director of Environmental Quality
Tennessee Valley Authority
Forestry Building
Norris, TN 37828

Re: Bellefonte Nuclear Plant
Use of Coherex Dust Retardant

Dear Mr. El-Ashry:

Reference is made to your April 2, 1981 letter regarding the above referenced subject.

Following our review of this data, we find that we are in agreement with the use of Coherex, provided that the COD of the East Culvert Impoundment and Construction Holding Pond is monitored as outlined in your letter (i.e., during 5 or 6 selected heavy rainfall events for a trial period not exceeding six months after initiating use of Coherex).

Should you have any questions, feel free to call.

Yours very truly,

James P. Martin
Engineer, Technical Staff
Water Improvement Commission

JPM:ppr

ATTACHMENT 2

SPECIAL MONITORING PROGRAM FOR COHEREX

Sample Location	Parameter	Sample Type	Measurement Frequency	Starting Date
Construction Holding Pond Discharge	COD	GRAB	1/Week; When NPDES sample is collected	Next NPDES sampling
East Culvert Impoundment Discharge	COD	GRAB	1/Week; When NPDES sample is collected	Next NPDES sampling