

TODAY'S CLAY SOILS



CONDOR

LANDLIFE

EARTH
SCIENCE
PRODUCTS

THE POWER OF

“ION EXCHANGE”

WHO IS EARTH SCIENCE PRODUCTS?

A BIT OF HISTORY.....

Earth Science products Corp was formed in 1972 by Edsal "Ed" Wood and Dick Gearhardt. Dick Gearhardt served his country in the military before working for the forestry service. While at the forestry service, he was placed in road development which exposed him to soil mechanics and the severe and recurring damage caused by expansive clay soils. Dick began to utilize his background in chemistry to combat the problem. It was then that he realized the true nature of the issue....the imbalance of ionic charge in the clay soil. This led him to develop a partnership with the late great Lee G. Reynolds who also understood the nature of the clay soil. Together they developed ion exchange technology, introducing the first two predecessors to modern ion exchange resins (IERS) and eventually the third generation product CONDOR SS was born. CONDOR SS is still used in the perfected formula today.

ESP was the first to mass produce a high quality, consistently performing product. Over the years, there have been many copies of the CONDOR SS product, though none have been able to achieve its success rate of 100%.

After Dick Gearhardt started his own company, he partnered with Mr Ed Wood, a well-known, highly respected botanist and nurseryman hall of fame inductee. Together, they developed several complimentary products to CONDOR SS. One of the first, Wood's Rooting Compound, was used effectively to reforest the scorched earth surrounding the 1981 Mt St Helens eruption. CONDOR AG LandLife was also used in that project, and has since become one of the most successful products in the company line. The same clay that holds onto water and swells beneath roads and buildings, also holds onto water containing un-dissolved salts, making fertilizer uptake by plants very difficult, requiring more water and nutrients than usual. CONDOR AG Landlife reduces the amount of water required, the amount of fertilizer required and, with repeated use, brings the soil back to a pristine 'virgin' state, able to support repeated commercial cultivation.

CONDOR AG LandLife is now used in over 20 countries throughout the world. Although it is marketed under different names, it is the same consistent, high quality product formulated, tested, and perfected decades ago. ESP takes great care to ensure that the CONDOR AG LandLife you apply to your land is the very best we can produce.

Today, ESP is still a family operation. President Shane Kennedy and his Mother Sandra Kennedy still run the business with the same care and eye for quality that started it all back in 1972. Ask them today and they will tell you "the sky is the limit!"

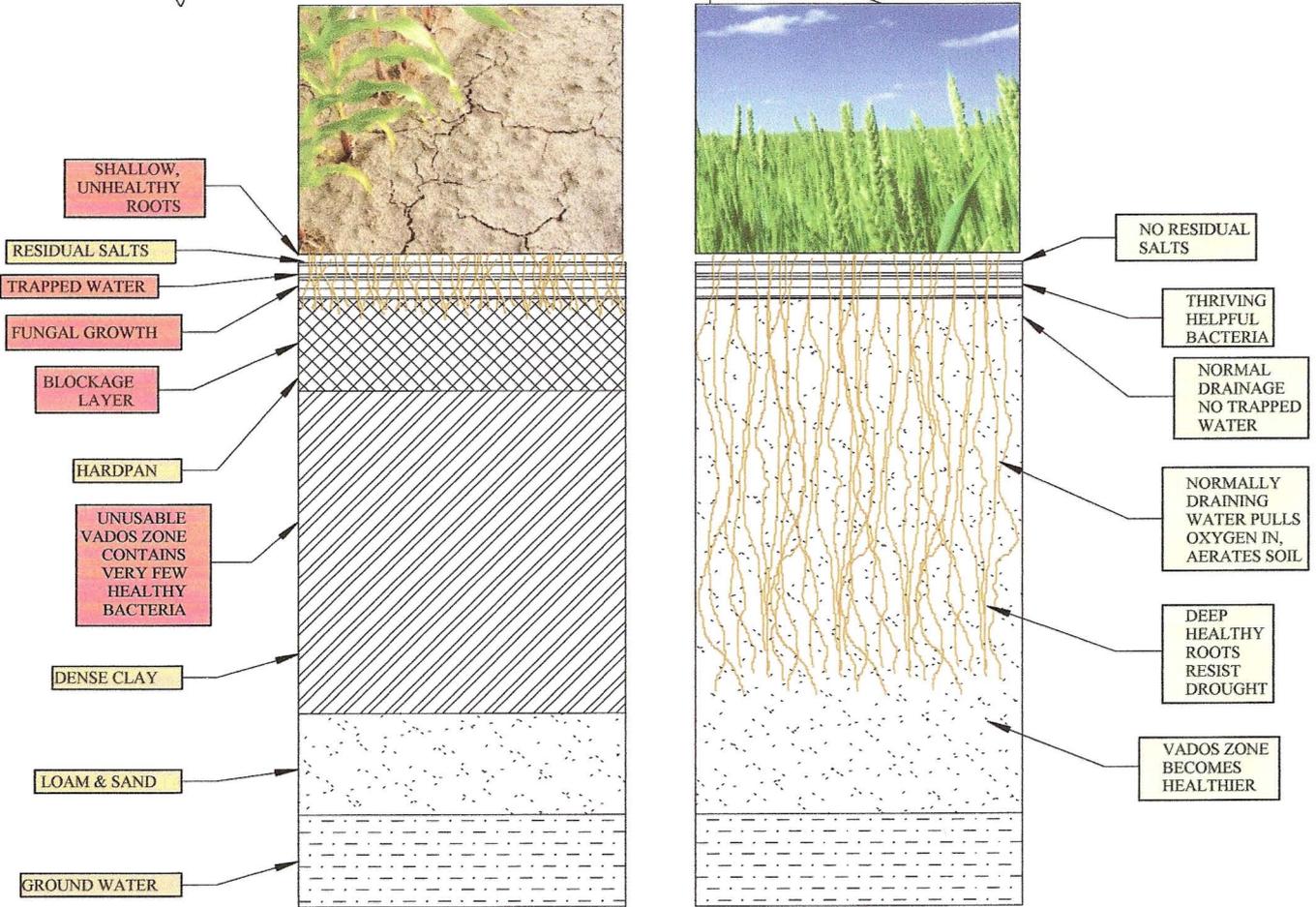
From the early struggles of Mr Gearhardt to convince critics of the efficacy and overall benefit to the planet from the use of the products, to the ongoing efforts today of Shane and Sandra Kennedy to produce products that enhance and compliment the planet we inhabit...ESP is a company that cares about the earth. The earth is in our name, because it is in our care.

Earth Science Products....people *you* can believe in.....
people who believe in *you*.

The "CONDOR AG EFFECT"®

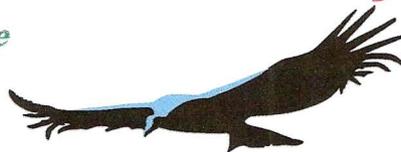
"Before" CONDOR AG.

"After" CONDOR AG.



Features and Benefits...

- ✓ *Makes Dense Clay Usable*
- ✓ *Releases Bound Nutrients*
- ✓ *Kills Harmful Bacteria*
- ✓ *Encourages Good Drainage*
- ✓ *Frees Trapped Water*
- ✓ *'Norms Out' Ph Level*
- ✓ *Encourages Beneficial Bacteria*
- ✓ *Encourages Deeper Root Growth*



CONDOR AG®
LAND LIFE

THE MECHANISM OF CLAY PROPERTY CHANGE

THE "CONDOR EFFECT"

SOILS CONTAINING LARGE AMOUNTS OF HUMUS AND ORGANIC MATTER THAT IS NOT PROPERLY DIGESTED OR REDUCED CAN PRODUCE CONDITIONS THAT ENCOURAGE DISEASE AND ORGANISMS THAT CAN ATTACK EVEN HEALTHY PLANTS. THE USE OF CONDOR AG LANDLIFE ENCOURAGES THE GROWTH OF HEALTHY BACTERIA.

IONIZATION

CONDOR AG LANDLIFE IONIZES THE DILUTE WATER WHICH THEN CARRIES THE ELECTRICAL CHARGE INTO THE GROUND



REVERSAL OF CATIONIC FORCES

THE ELECTRICALLY CHARGED WATER MIGRATES THROUGH THE SOIL, NEUTRALIZING THE CATIONIC (POSITIVE) CHARGES PRESENT

REPOLARIZATION OF INDIVIDUAL CLAY PARTICLE

THE CHARGE IN THE CLAY PLATELET IS NEUTRALIZED SO THERE IS NO LONGER ANY ATTRACTIVE FORCE

RELEASE OF ABSORBED WATER AND TRAPPED NUTRIENTS

WITHOUT THE CHARGE IN THE PLATELET THERE IS NOTHING TO HOLD THE TRAPPED (PELICULAR) WATER AND THE MICRONUTRIENTS CONTAINED IN IT THAT PLANTS NEED TO SURVIVE, INCLUDING NH_4^+ , K^+ , Ca^+ and Mg^{2+}

PROPER AEROBIC ENVIRONMENT

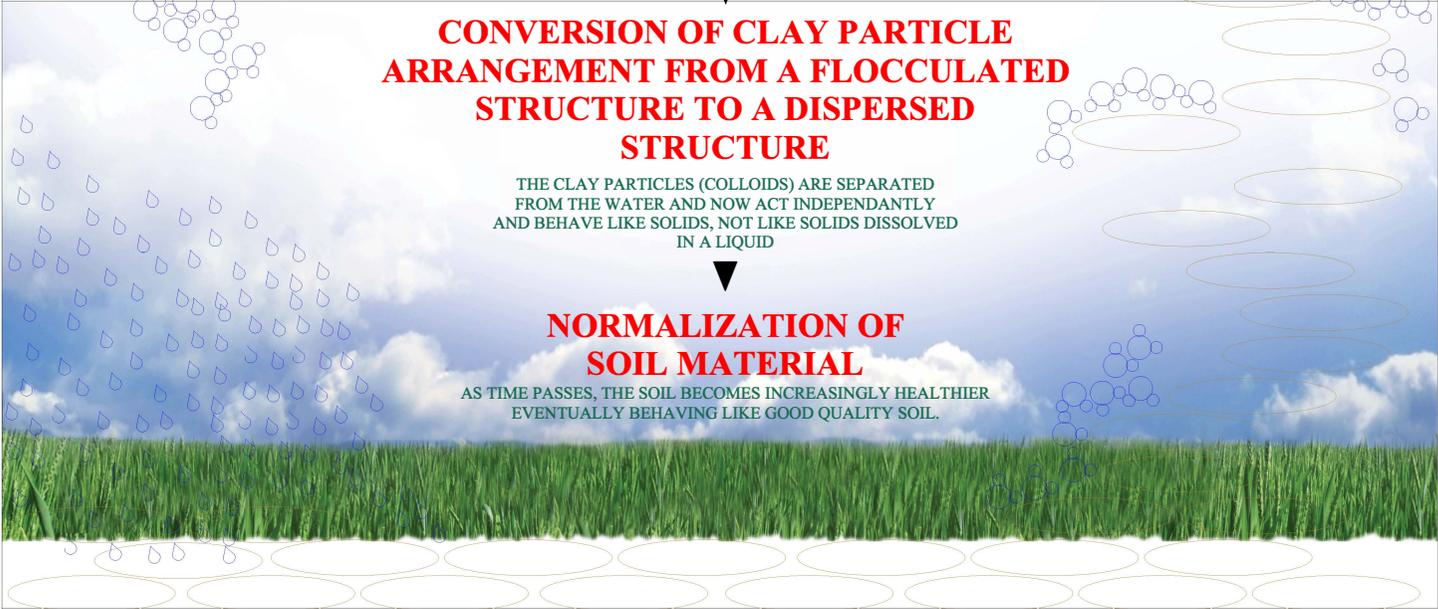
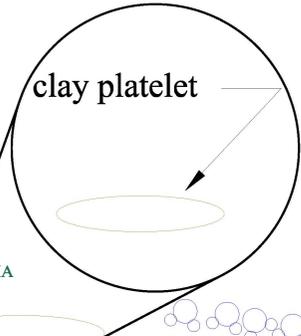
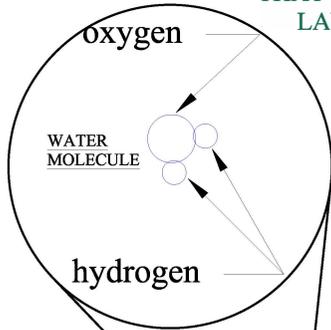
WITH THE PROPER OXYGEN-RICH ENVIRONMENT, THE PROPER LEVELS OF BACTERIA ARE PRODUCED INCREASING HEALTH OF THE ROOT SYSTEM AND PROPER UPTAKE OF NUTRIENTS.

CONVERSION OF CLAY PARTICLE ARRANGEMENT FROM A FLOCCULATED STRUCTURE TO A DISPERSED STRUCTURE

THE CLAY PARTICLES (COLLOIDS) ARE SEPARATED FROM THE WATER AND NOW ACT INDEPENDANTLY AND BEHAVE LIKE SOLIDS, NOT LIKE SOLIDS DISSOLVED IN A LIQUID

NORMALIZATION OF SOIL MATERIAL

AS TIME PASSES, THE SOIL BECOMES INCREASINGLY HEALTHIER EVENTUALLY BEHAVING LIKE GOOD QUALITY SOIL.



Application Effects:

1. Provides formation of granulated soil
2. Removes accumulated salts from soil
3. Normalizing of Ph level in the soil
4. Suppression of harmful bacteria
5. Enhanced activation of fertilizers
6. Reduced use of water

Condor AG LandLife Components:

Organic carbon, Petroleum Sulfonate, Iron, Calcium, Phosphor, Sodium, Potassium, and other microelements.

1. Capability to build the granule

The organic carbon, which is contained in the product in large quantity, enhances the bonding strength in the soil to bring the particles together to form granules.

2. Ability to remove the salts (unused fertilizer components)

Unused fertilizer in the form of salts becomes bound to the platelets in the clay through electrochemical attraction, making them unavailable to the plant. The powerful electrochemical charge in CONDOR AG LandLife breaks this bond, allowing the salts to become soluble again for use by the plant. Excess salts are also now free to drain away, preventing further buildup in the future.

3. Adjustment to Ph in the soil

Through the same process defined above, the harmful substances in the soil (sulfate radical, nitrate radical, chlorine etc...), are adjusted to normal Ph levels. In acidic soils, Hydrogen ions are replaced with the anion (negative charge) from LandLife, thereby lowering the acidity. In alkaline soils, the cation (positive charge) in LandLife is combined with the hydroxide ion, thereby increasing acidity to normal levels.

4. Suppression of harmful bacteria

The unique oxidizing action of LandLife improves the soil environment, creating conditions that favor the helpful bacteria. This effect serves to lessen the proliferation of harmful bacteria.

5. Enhanced activation of fertilizer

Due to the release of the bound salts, they are now water soluble and become available for absorption by the plant.

6. Reduction of water usage

Permeability is increased, therefore excess water is not needed to reach the roots of the plant. Bound salts are released and leach normally and water uptake is now properly regulated and unhindered by the residual salts.

Why LandLife is needed in modern Agriculture

Extreme stresses are placed on today's farm land, resulting in frequent physical and chemical changes to the soil. Newly developed land can produce a good harvest by supplying fertilizer for insufficient components. However, if the land is cultivated repeatedly (especially if the same crop is grown), the quality of the harvest gradually deteriorates over 2-3 seasons (in a greenhouse environment). Outdoors, the cycle is longer, generally 5-6 years to deteriorate. For both applications, yield will decrease with quality.

The cause of the problem can be explained thus;

1. Salts (unused fertilizers) become bound to the soil and therefore unavailable for the plant to consume causing a buildup of these salts over time. When the concentration becomes higher in the soil than in the root cell, the cell solution escapes into the soil (reverse osmosis). This hampers the plant's ability to absorb water and nutrients. In this weakened state, the roots, and the plant as a whole, becomes weakened and susceptible to pests and soil-borne infections.
2. When a specified crop is grown repeatedly, harmful bacteria and insects which attack the particular crop, grow and expand in concentration, causing more damage to the crop.
3. The trace elements preferred by the specific crop (manganese, boron etc...), are absorbed completely by the plants, leaving only small amounts in the soil, further limiting the plants' growth and eventual yield.
4. The toxins formed in the plant during growth are discharged into the soil and absorbed by the adjacent plant, causing autotoxemia.
5. The humus in the soil is reduced and the soil forms separate particles, becoming hard ground with poor drainage and low permeability. The lower permeability prevents much-needed oxygen from reaching roots.
6. Due to the excessive salts (residue), other nutrients and trace elements cannot be absorbed.
7. When rainfall is excessive, the soil increases in acidity. When fertilizer is applied in excess, the soil will become very alkaline. LandLife remedies both of these issues by correcting Ph.

Usage Method For Respective Applications

1. Elimination of Problems Due to Repeated Cultivation

Practically all the problems associated with repeated cultivation are attributed to excessive accumulation, or the deterioration of the base balance. When deposited salts are removed through a complete washout, the soil returns to a natural virgin state. While applying LandLife during cultivation is extremely effective, it should be applied during the fallow period...before crops are planted. LandLife is the only product proven to remove the accumulated salts from the soil.

Application Time	Concentrate/10acres	Remarks
During the fallow period or shortly Before the end of cultivation	2 gal to 4 gal	A) Mix with water remaining in the field 1 st yr 2 nd yr 3 rd yr 4.5 gal 2.25 gal 4.5 gal B) Dissolve into 220 to 440 gal of water before plowing and irrigate totally before and after rain or snow. Performance is increased by adding 500-700 gals of water after treatment.

2. Improved Water Drainage – Elimination of Swampy Fields

Application Time	Concentrate/10 acres	Remarks
A) Water field before Or after field tilling in Preparation for transplantation B) Before the interim Drying C) After the harvest	4.5 gal	Improved permeability
Field: Fallow period Greenhouse: After harvest Outdoors: Before Autumn	4.5 gal	Dilute by 200-400:1 Irrigate field before rainfall or snow

3. Removal of the Concentration Disturbance

Concentration disturbance is the trouble caused by the accumulation of salts with high EC which causes root damage through poisoning. This problem occurs mostly in greenhouse fields or where multi-cultivation is used. The concentration disturbance wields a serious influence on crop yield and good product ratio.

Application Time	Concentrate/10 acres	Remarks
Irrigation time before the Final transplantation	1 to 2 gal	In case the application cannot be made during the fallow period, dissolve it with 220-440 gallons of water and irrigate it at the center section of furrows after the furrowing work is completed. One or two days later, apply 220-440 gallons of water only. Transplant one or two days later.

During the growth period;

Concentration Disturbances....

Severe Case: Use 2 gals (1st time); 1 gal (2nd time); 1 gal (3rd time), at every irrigation time with as much water as possible.

Light Case: Use 1 gal (1st time); 1 gal (2nd time); ½ gal (3rd time), at every irrigation time with as much water as possible.

After Improvement: Use 1 gal (1st time); 1 gal (2nd time); 1 gal (3rd time). Mix ½ gal into liquid fertilizer and apply about 3 times per month.

Standard Intervals For Treatment: Every 1-2 days for summer.
Every 4-5 days for winter.

Application Time	Concentrate/10 acres	Remarks
For plants with a large With a large application of fertilizer or for the enhanced fertilizer effect for promoting growth	1 st time: 1-2 gals 2 nd time: ¼ gal – ½ gal	Use ½ gal – 1 gal a month in 2 or 3 separate applications together with liquid fertilizer, (for activation of fertilizer, improved air permeation and moisture holding capacity.

4. Case of Orchard or Tea Plantation garden – Test Case

Particularly in the case of the orchard, slight concentration disturbance is caused intentionally before harvest of fruits in order to increase the size, color or taste (e.g. increase sugar content). For this purpose, the fertilizer amount is increased. After the harvest however, EC is kept high and the root and sprout cannot grow (branches fail to develop or are too weak). This has an adverse effect on the next year’s harvest, which will be reduced. This is the largest contributor to reduced yields in greenhouse oranges or heated greenhouses.

LandLife needs a considerable amount of water...1200 – 1700 gals per quarter acre. However, this amount of water is only needed if the soil is dry. If soil is treated after a rainfall, it is more efficient to apply the product in a more concentrated mix.

1	Deep plowing effect. Recovery of tree force after the harvest. Remedy of trade element deficiency. Improvement of water drainage. Removal of harmful substances.	2-4 ½ gals per 10 acres	200-400:1	Application before or after rainfall, or before the snowfall (effect will be improved if mixed with the deficient element).
2	For improvement of the phosphoric acid absorption coefficient.	½ - 1 gals per 10 acres	200-400:1	In 3 or 4 days after LandLife is applied, the phosphoric acid in effective form is increased.
3	Remedy of root rot from excessive water.	1 – 4 gals per 10 acres	200-400:1	LandLife improves water drainage and soil aeration.

Precautions

- LandLife is harmless to humans and livestock when used in diluted form as directed on the label.
- It will freeze at 23 degrees Fahrenheit (-5 degrees centigrade).
- Wash treatment equipment thoroughly after use.
- Skin may feel roughened if contacting the concentrated product.
- Quality does not diminish when stored for long periods, if kept out of direct sunlight.
- Remove the lid from empty containers and rinse thoroughly with water.

Summary

Landlife in the concentrated form is acidic. When diluted according to the application instructions and applied to the soil, the chemical properties of the product change due to the unique electrolytic elution actions inherent in the product, and become neutral.



Material Safety Data Sheet

CONDOR AG LandLife®

A. GENERAL INFORMATION

Trade Name: CONDOR® AG LandLife
Chemical name and/or Synonym: Ion exchange resins and surfactants in sulfuric acid
Manufacturer: Earth Science Products, Corporation
23735 NE Airport Rd.
Aurora, OR 97002 USA
Mailing Address: PO BOX 327,
Wilsonville, OR 97070

Contact: InfoTrac
800-535-5053 Date of Issue: March 1996

B. FIRST AID MEASURES

Emergency Phone Number: 800-535-5053
Skin or Eyes: Immediately flush with plenty of water. For eyes continue for at least 15 minutes. If irritation continues get medical attention.
Ingestion: Do not induce vomiting. If conscious, give several glasses of milk (preferred) or water.
Inhalation: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing with difficulty, give oxygen, provided a qualified operator is available.
GET IMMEDIATE ASSISTANCE for ingestion, eye contact, or continued labored breathing.

C. HAZARD INFORMATION

Health
Inhalation: Inhalation of fumes or acid mist can cause irritation or corrosive burns to the upper respiratory system, including nose, mouth and throat.
Ingestion: Can cause irritation and corrosive burns to mouth, throat, and stomach.
Skin: Can cause minor skin burns.
Eyes: Liquid contact can cause eye irritation or corneal burns. Mist Contact may irritate or burn.
Permissible Concentration: AIR 1mg/Cu. M. (as H2SO4) (OSHA)
Unusual Chronic Toxicity:
1. Erosion of Teeth
2. Reddening of the Skin
3. Conjunctivitis
4. Gastritis

Fire and Explosion: Flash Point Auto Ignition Temp. Flammable in Air
Not Flammable N/A N/A

D. FIRE AND EXPLOSION HAZARD DATA

Fire Extinguishing Agents Recommended:

If involved in a fire, use water. If only a small amount of combustibles are present, smother with dry chemical.

Extinguishing Agents to Avoid: Use water or other suitable agent for fires adjacent to non-leaking containers.

Special Fire Fighting Precautions: Avoid using solid water streams near ruptured tanks.

Ventilation: None required outside. May require mechanical exhaust system **in closed storage area.**

Normal Handling: Do not get in eyes, on skin, or on clothing. Do not breathe vapors or mist. When diluting always add to water. Use adequate ventilation. Use protective equipment as outlined in Section E.

Storage: Protect Containers from physical damage. Store under Cover. Protect container from direct sunlight. Protect from freezing.

Spill or Leak: **(ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT)**
Dilute small spills or leaks with plenty of water. If in a confined area neutralize residue with alkali such as soda ash or lime. Adequate ventilation is required due to release of Carbon Dioxide. No smoking in spill area. Major spill must be handled by a predetermined plan.

Special Precautions/Procedure/Label Instructions:

Corrosive – See Reactivity Data

E. PERSONAL PROTECTIVE EQUIPMENT:

Respiratory Protection: Respiratory is required if mist is present.

Eyes And Face: Goggles or Full Face shield.

Hands Arms and Body: Rubber clothing is adequate.

Other Clothing & Equipment: Rubber

F. PHYSICAL DATA

Material is: (at Normal Conditions):

Liquid

Appearance and Odor: Oily, Dark Colored, with Characteristic Odor

Boiling Point: N/A

Specific Gravity: H₂O – 1.0 1.15 Min

Vapor Density: N/A Solubility In Water: Completely

PH: Approximately 0.9

Vapor Pressure:

Evaporation Rate: N/A

% Volatiles By Volume: N/A

G. REACTIVITY DATA

Stability: Stable

Conditions to Avoid: Prolonged temperatures above 300 degrees C will eventually evaporate the water, and Sulfur Trioxide will be given off.

Incompatibility

(Materials to Avoid): Contact with reactive metals such as Zinc will result in the evolution of Hydrogen.

Hazardous Decomposition or By-Products:

Sulfur Trioxide - See Above

Hazardous polymerization will not occur.

H. HAZARDOUS INGREDIENTS (Mixtures Only)

Material or Component/CAS #: Sulfuric Acid/7664-93333-9

WT %: 18

Hazardous Data: Section J

I. ENVIRONMENTAL

Degradability/Aquatic Toxicity: See waste disposal methods, this section, below.

EPA Hazardous Substance (Clean Water Act Sect 311)

Waste Disposal Methods: Dilute and waste irrigate as per the Manufacturer's instructions for applications.

J. REFERENCES

Permissible Concentration References:

OSHA Standard (for H₂SO₄) at 29 CFR 1910.1000 (1981)

Regulatory Standards:

D.O.T. Classification – Corrosive Material



Texas-specific Use of CONDOR AG LandLife

Earth Science Products Corp. has manufactured and distributed several different products in the State of Texas for over 30 years. In this time, we have attained invaluable knowledge in the use of our products in the “fat” clay soils found in such abundance in your state. Here are some ‘tips’ we wish to pass on to you that we feel will help you be more successful in your endeavors.

- ✓ The “Condor Effect” is the softening of the clay. It occurs over time as you treat with the product. After repeated use, the soil will drain normally, and absorb water readily without swelling. It will not crack when it dries out.
- ✓ Water the ground thoroughly before applying Condor AG.
- ✓ Water thoroughly after applying the Condor AG.
- ✓ Use the above technique whenever laying sod, before you lay the sod down.
- ✓ Remember: 1 gallon of Condor AG to 300-500 gallons of water. If the ground will not absorb the water, apply in smaller amounts, incrementally, until the “Condor Effect” is observed.
- ✓ If it seems like a lot of water, it is! That’s how it works. If using a hose-end sprayer, set it to dilute at 4 oz per gallon.



CONDOR AG®

LandLife

Features and Benefits;

- *Cost Effective...Saves Fertilizer*
- *Fast – Begins Working Immediately*
- *Normalizes Ph*
- *Increases Soil Permeability*
- *Penetrates Into The Dense Bulk Clays*
- *Reduces Fuel Costs*
- *Eliminates Salts Buildup*
- *Reduces Water Usage*
- *Non-Toxic, Non-Flammable, Non-Corrosive* ®
- *Easy – Irrigate or Spray*
- *Increases Soil Productivity*



CONDOR AG®
LAND LIFE

POOR DRAINAGE

**IS A CLASSIC EXAMPLE OF
CLAY CONTAMINATION**

**THE PROBLEMS ARE
ATTRIBUTED TO THE
IMBALANCE OF “IONIC
CHARGES” RESULTING IN A
NET “ANIONIC” OR
NEGATIVE CHARGE.**



**ONCE THE “IONIC
VALUE” HAS BEEN
BALANCED**

**THE SOIL EXHIBITS
CHARACTERISTICS OF
TOP SOIL**

**AGGREGATING
PROPERLY RELEASING
BOUND NUTRIENTS AND
ALLOWING PLANTS TO
ROOT EASILY.**