

### The Long and Dusty Road

It is the late 80s, and in the almost stereotypically hot and dry outback of Australia, a chemical engineer has found a unique composition with promise. The promise isn't about saving lives or fighting world hunger or reducing greenhouse emissions. Instead it is about solving a chronic problem anywhere that dry and dusty roads or construction sites sit adjacent to populated areas. We've all experienced a circumstance where the boiling dust from an unpaved road or the dirt parking lot at the fairground has choked us, watered our eyes or coated our freshly washed cars. For those unfortunate enough to have a home or office that sits on even a mildly used unpaved road, the battle against the uniform powder that coats everything and mutes the color of the shrubs and paint never seems to end.

What this researcher discovered was a means by which these dusty surfaces could be treated, simply and effectively, to capture minute amounts of moisture vapor from the air and thus bind this moisture on the soil's surface to mitigate dust. Seems simple enough and it was quite successful. The product was refined, packaged and marketed for this singular purpose. End of story? Not quite. In fact, that is just a drop in a very large bucket of unexpected twists that would bring this understated and modest technology to the forefront of a global struggle to ensure the availability of the most precious resource on Earth. It isn't gold, or diamonds, or even oil. It is the most abundant substance on the planet, and ironically the most threatened. It is water.

To most American homeowners, water is a mundane utility that becomes more costly only in terms of the monthly statement we must pay, and in the potential fines associated with watering restrictions during dry summer months. This brings us back to our Australian researcher and his dust control discovery. In 1991 Ronald P. Hansen speculated that the effect of holding evaporative loss of moisture in the soil may have benefit beyond dust control, and he was right. The evaporation of moisture from the soil not only increases airborne dust particles, it also adversely affects the health of all plants which count on that soil moisture for survival.

Once converted to vapor by seasonal drought, or even daily dry periods, moisture becomes unavailable to plant roots that require liquid moisture to sustain critical internal processes.

The technology, originally developed to control dust was reformulated and branded as Hydretain®. What began as a fight against nuisance environmental dust, had suddenly become a compelling and more vital role in water conservation. This role would prove critical in reducing crop losses during drought, reducing the usage of fresh and potentially potable drinking water reserves for irrigation, and increasing the overall health and vigor of vast tracts of lawn and landscape as well as. These three effects, though seemingly unrelated, are profoundly interconnected in that they represent the potential to achieve what this modest technology never set out to do – save lives, combat world hunger and reduce greenhouse emissions. A wild boast? Let's examine this closer...

### **How it works**

Hydretain is designed to reduce plant watering requirements by up to 50% or more. It is a liquid blend of hygroscopic and humectant (water-attracting) compounds which capture moisture vapor in the soil that would otherwise be lost to daily evaporation and seasonal drought cycles. Once applied, Hydretain is drawn toward plant roots along with water and nutrients. Where water and nutrients are absorbed into the root, the complex Hydretain molecule is stopped, forming a thin film along the root surface. When liquid moisture is no available in the soil, there remains a condition where there is nearly 100% humidity in the air spaces between soil particles. It is normally at this point where plants would begin to show the early signs of wilt and drought related stresses.

As this vapor migrates upwards to be lost back to the atmosphere, it comes in contact with the Hydretain film. The vapor is then aggregated back into droplets of liquid water which remain as tiny reservoirs which plants use to sustain them between periods of moisture. Subsequent application of water to treated areas, such as

rainfall or irrigation are utilized more effectively due to the reduction of evaporative loss.

By making more effective use of water that would otherwise be lost to evaporation, Hydretain dramatically reduces the demands placed on managed and natural water resources. This logically translates into less water used for irrigation, in turn yielding more water available for other purposes.

Consider that while 70% the Earth's surface is covered in water, less than 1% of it is drinkable. In fact 97% of that water is in the form of seawater, which is difficult and expensive to desalinate, or locked up in polar ice. That remaining one percent must sustain an ever-expanding population through the next millennium. Whether it will be enough depends on a number of factors, but it is clear that products such as Hydretain have a role to play.

### **Water is Life**

In its many forms, water touches all life, and unless you are in the developing world, there's a good chance you take many such water uses for granted. It is highly probable that it never crosses your mind as you drink your morning coffee where the water came from to make it. It is equally probable that as you drive your car to work, you really don't consider that the water in your windshield wiper reservoir is a precious rare amount to a farmer in central Africa. The point is simply that we often don't consider how the water we use is sequestered within our luxuries and largely out-of-sight and out-of-mind. This is not a indictment of western society. It is merely an expression of how our technology has insulated us from the fact that in much of the world, access to potable water isn't nearly as common as we may expect.

To put this disparity into perspective, here are few sobering statistics:

- 1.1 billion people in the world do not have access to safe drinking water, roughly one-sixth of the world's population.

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- 2.2 million people in developing countries, most of them children, die every year from diseases associated with lack of access to safe drinking water.
- An estimated 25% of people from cities in developing countries purchase their water from vendors at a significantly higher price than piped water. In some cases, at the cost of more than a quarter of their household incomes.
- 84% of water-related deaths are in children ages 0 – 14.
- 98% of water-related deaths occur in the developing world.
- Less than 1% of the world's fresh water (or about 0.007% of all water on Earth) is readily accessible for direct human use.
- An American taking a five-minute shower uses more water than the typical person living in a developing country slum uses in a whole day.
- The daily requirement for sanitation, bathing, and cooking needs, as well as for assuring survival, is about 13.2 gallons per person.  
(3)
- A typical family in a developed nation can use more than 400 gallons of water per day, with over 30% of total usage outside the home. More than half of that outdoor water is used for watering lawns and gardens. In the United States, landscape irrigation is estimated to account for almost one-third of all residential water use, totaling more than 7 billion gallons per day. This figure does not account for other outdoor uses such as washing cars, maintaining swimming pools, and cleaning sidewalks and driveways.

As if the water crisis weren't enough, population growth shows no evidence of slowing. More people means more drinking water needs and more food. In order to grow more food, farmers must have access to more irrigation water. It doesn't take a great leap of logic to suddenly realize that we are competing against our own food supply for life sustaining water. Once again, Hydretain holds the potential answer by making more efficient use of what irrigation resources are applied to crops, farmers can be assured that their crops will remain vigorous and more productive in the face of less

water available for irrigation, and a more complete use of what water is applied.

Hydretain has been proven to increase crop yields. When plants experience drought stress they decrease production as they enter into a survival mode. By managing moisture in the root zone, Hydretain helps reduce drought stress, ensuring that your plants remain healthy and productive. According to a University of Florida and Penn State study, plants treated with Hydretain produced 54% more tomatoes than untreated plants during drought conditions. A recent study on potato and broccoli plants showed Hydretain's ability to reduce irrigation by 44% while maintaining equal quality and yield when compared to fully irrigated crops.

### **Understanding Water Challenges in the Industrialized World**

A typical American family of four can use 400 gallons of water per day, and about 30 percent of that is devoted to outdoor uses. More than half of that outdoor water is used for watering lawns and gardens. Nationwide, landscape irrigation is estimated to account for almost one-third of all residential water use, totaling more than 7 billion gallons per day. This means that nearly 2,200 gallons of water per month are being used on average home lawn. At average cost of \$8 per thousand gallons, the typical Florida family who isn't concerned with maintaining ideal lawn health is still spending nearly \$60 every three months in lawn watering alone.

Irrigation accounts for about a third of water use and is currently the largest use of fresh water in the United States. Irrigation water use includes water devoted to growing crops, frost protection, chemical applications, weed control, and other agricultural purposes, as well as water used to maintain areas such as parks and golf courses. Historically, more surface water than ground water has been used for irrigation. However, the percentage of total irrigation withdrawals from ground water has continued to increase, from 23 percent in 1950 to 42 percent in 2000. Irrigated acreage more than doubled between 1950 and 1980, then remained constant before increasing nearly 7 percent between 1995 and 2000. The number of acres irrigated with sprinkler and microirrigation systems has continued to

increase and now comprises more than one-half the total irrigated acreage.

Some experts estimate that up to 50 percent of commercial and residential irrigation water use goes to waste due to evaporation, wind, improper system design, or overwatering. Converting to a water-efficient landscape through proper choice of plants, careful design and using proper soil moisture management techniques to prevent over- and underwatering can reduce outdoor water use by 20 to 50 percent, or more than 20,000 gallons per household per year, but this is often easier said than done.

Did you know that there are roughly 28 million acres of turf grass in the United States, 80% of which are residential lawns? It's not hard to understand where a huge portion of our water goes. With agriculture responsible for 70% of available water usage, and another 10% used by households, Hydretain is in a unique position to positively effect both sectors and reduce domestic water demand, contributing to a healthy legacy for future generations.

In a study conducted at the University of Texas golf course, an estimated 1.5 million gallons of water per week were saved simply by applying Hydretain. To the University of Texas, that represents quite a savings in utilities, pumping costs, equipment wear and manpower. However, apply such watering reductions to areas of the globe where drought and lack of access to clean drinking water routinely costs tens of thousands of lives annually and you have a truly world-altering technology that has profound implications for mankind.

### **Green is Cool**

In an effort to conserve critical water reserves, an ever-growing number of municipalities have instituted regular seasonal watering restrictions. These plans typically involve scheduled rotations where neighbors alternate irrigation allotments. These schedules are strictly enforced with steep fines and criminal penalties for violation of local water ordinances.

In some areas, the measures are even more aggressive. In a rather short-sighted example of what lengths some cities will go to, at least two major western cities are subsidizing the removal or plant material from entire neighborhoods and replacing it with gravel or stone features. While this may seem well-intentioned, it is actually counterproductive. It has been scientifically proven that trees, shrubs and lawn areas around homes reduce air temperatures from 7°-14° Fahrenheit through the effects of shading and evapotranspiration. One estimate suggests that strategic planting of lawns and other landscape plants could reduce total U.S. air conditioning energy requirements by 25 percent. This can not only directly curb summer air conditioning costs, but it can also dramatically reduce evaporative loss of soil moisture. In essence, healthy landscaping a great way to reduce temperatures and actually conserve ground water.

What's more, all plants naturally process carbon dioxide (CO<sub>2</sub>) and release oxygen (O<sub>2</sub>) and water (H<sub>2</sub>O). By removing plants from residential areas, they are actually reducing the amount of CO<sub>2</sub> being metabolized leading to higher localized levels of greenhouse gases. Would it not make far more sense to leave the plants in place, treat them with products such as Hydretain and enjoy the benefits of reduced temperatures, reduced evaporative loss and reduced CO<sub>2</sub>?

### **A Technology on a Mission**

University research has proven Hydretain's ability to reduce the watering needs of ornamental plants and trees, increase crop yields for food producing agriculture, and improve grass seed germination rates. After years of use by golf course superintendents, sports turf managers, and other green industry professionals, Hydretain has recently been made available to residential consumers through retail channels as well as program sponsoring lawn maintenance operators to educate homeowners about water conservation and how Hydretain can help.

With increasing concerns over water costs and availability, many homeowners are realizing the benefits of adding Hydretain to their

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landscape maintenance program. According to G.R. of Littleton, Colorado, “With one application I was able to cut my watering bill in half. Hydretain is a great product ... Due to the drought conditions in the Denver area water departments instituted severe watering restrictions – not only limiting the number of days but also the number of hours homeowners can water their lawns. Hydretain kept my lawn green all summer and paid for itself many times over.”

Formulated from food grade materials, and containing no hazardous chemicals, Hydretain is environmentally friendly and safe to use on food-producing agriculture and around children and pets. Hydretain is also biodegradable and contains no phosphates, petrochemical derivatives, or other toxic fractions that may cause groundwater or runoff contamination. Lasting for up to three months in the soil Hydretain is cost-effective enough for large-scale commercial application and highly effective in remote areas where re-application is either difficult or manpower intensive.

With all that is at stake, from saving a few ornamentals in your yard to ensuring a village get the most out of their crops and their meager water reserves, we all need to take a hard look at products such as Hydretain. Coupled with better management practices, education and research, we can ensure that access to clean water for drinking and irrigation will be given for future generations of all nations.

Dwindling water reserves are real, and the ability to conserve is equally real.