



## AG TILING TREND MOVES FROM PATCHWORK TO TOTAL REPLACEMENT

*Farms Find Higher Yields and Add Acres for Drainage System*

IRVING, Texas - Since the early 1960's, when plastic pipe was first used to replace clay tile, farm field drainage was mainly done in low lying areas. Now, the trend is to completely tile a farm and not just specific areas. Recently, a 2,300-acre farm in the eastern Corn Belt installed two million feet of corrugated high-density polyethylene (HDPE) pipe to completely tile all its fields. The system also incorporated three farm drainage conservation practices -- controlled drainage, saturated buffers and woodchip bioreactors -- on the farm which now grows conventional corn and soybeans along with organic corn and soybeans.

"For us, a contractor, this project is unique," said Bob Clark III of Clark Farm Drainage, Inc. (New Castle, IN), "because we're updating a farm's entire tile system, whereas we typically work with farms during many years and slowly update and add to the system. I would estimate that 80 to 90 percent of the fields we put tile in have existing tiles.

"We even see farms where we installed a drainage system on a field, and 20 years later the grower comes back and says the field doesn't have enough tile in it now, and it needs a complete renovation with new tile. So, we parallel drain the whole field."

According to the Plastics Pipe Institute, Inc. (PPI), tiling fields continues to increase because field drainage allows excess water to pass through the soil at a more effective rate

resulting in higher crop yields. PPI is the major North American trade association representing all segments of the plastic pipe industry.



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"One hundred years ago when people really started a big push to get tile in, they were tiling low areas," Clark explained. "The tile just replaced a ditch or drained low areas of the field. Since the 1970's when plastic pipe started to become more readily available, we saw people move to more parallel drain systems. Then in the 80's people started to pinpoint targeted areas to add parallel drains in their field. In the 90's, yield monitors slowly came on the scene giving farmers access to data and experts who knew how to read it and understand what it means.

"They now say the crop yields from parallel drains in a low wet area outperform the naturally better drained ground. The field that



they decided to pattern tile six, eight, or ten years ago, has been consistently outperforming other fields where the natural soil has a better yield index, or the potential for higher yield.

"What is happening now is that more and more growers are having the same realization. On this farm, there's a combination of existing clay tiles that might be 80 or 90 years old plus concrete tiles that were put in during the 50's, 60's or 70's along with plastic tiles put in during the 70's, 80's and 90's. They have some segments that have parallel drains, but it might be more targeted. If it's 100 acres, there might be a 20-acre patch with existing parallel drains."



A typical tiling system will use the flexible, corrugated HDPE pipe in diameters ranging from three to 24 inches. Manufacturers offer HDPE pipe with perforations, slots or pre-drilled holes that allow excess water to enter the pipe. On the project, Clark installed from three-inch flexible HDPE single wall tile to 18-

inch diameter double wall pipe that has three-inch slots. The pipe, called N-12® is a product of Advanced Drainage Systems, Inc. (ADS), (Hilliard, Ohio). The lateral drains were installed at an optimum depth of approximately three feet in soil that was silty clay loams with areas of sand and gravel over heavy clay. Clark's crew used three tiling machines including an Inter-Drain 2050 GP tile plow equipped with a Trimble RTK GPS unit as well as another Inter-Drain tile plow, an Inter-Drain continuous chain trencher plus other support equipment including bulldozers, skid steers and assortment of excavators.



"We used a drain spacing based on the ideal drainage coefficient for the cropping system and soils," Clark explained. "Different spots on the farm received different drainage regimes to meet the cropping system requirements given the soils."

"Some of the reasons for HDPE pipe's wide and varied use in farm fields is that it is easy to install and lasts a long time," explained Daniel



Currence, P. E. director of engineering for the Corrugated Plastic Pipe Division of PPI. "The material will not corrode, rust or degrade due to biological attack so the pipe resists bio-clogging and will be able to maintain high and consistent flow capacities over the service life of a system. The HDPE pipe has a very favorable strength-to-weight ratio. Plus, for any pattern of tiling the flexibility of the pipe easily accommodates changes in direction. It's also common to have a field crew such as Bob's run hundreds or even thousands of feet of HDPE pipe at one time. Even miles of pipe can be installed quickly because HDPE pipe in diameters smaller than six inches can be purchased in large coiled reels up to 5,500 feet."

### Woodchip Bioreactors

Water from the laterals is gravity fed into the collectors and mains to open ditches at the farm. Woodchip bioreactors were installed at several locations along with a 1,200-foot saturated buffer strip that will treat about 57 acres of the tile drainage.

"The bioreactors remove nitrogen from the drained water. Just as we breathe in oxygen and exhale carbon dioxide," explained Currence, "these micro-organisms breathe in nitrates and exhale nitrogen, which leaves the bioreactor and dissipates into the atmosphere as an inert gas."

### Saturated Buffers

A saturated buffer is another best water management practice at the farm. According to the Agricultural Drainage Management Coalition, (ADMC), a resource for drainage water management system technology, when proper site conditions and design

considerations are met a saturated buffer can be an effective method for reducing nitrate transport from subsurface drainage systems before the drainage is discharged to a surface water system. The buffer stores water within the soil by diverting tile water into shallow lateral control structures that raise the water table and slow the release at the outflow.

Designed by Agri Drain Corporation, Inc. (Adair, Iowa) the buffer met the company's specifications for the soil to have good organic content and the proper width of vegetation, grass, trees and shrubs. "The soil has to be highly organic," explained Charlie Schafer, president of Agri Drain, "because that's how we get treatment of the nitrates. It's consumed by the organisms in that highly organic soil and converted into nitrogen gas."

### Controlled Drainage

Included in the farm's new tile system are water level control structures, also known as flashboard risers, which enable the rate and height of the draining water to be either lowered or raised. The structures enable the farmer to limit the amount of water exiting the field to only the minimum necessary, helping to keep the fields properly drained while reducing the amount of nitrogen flowing off the field.

According to Schafer, "In their simplest form, flashboard risers are a watertight box fabricated with a set of tracks which separate the chamber into two separate parts. You slide the plastic panels into the tracks...one on each side...and pull up the panel to meet the lowest part of the water level. In this case, instead of two panels it had three compartments to hold back water in the field along with nutrients that can be used the next season.



"The second set of solid panels establishes the elevation for the water that is then distributed into buffer through the two distribution lines that run upstream and downstream. This is often done manually because they only need to be adjusted a couple of times a year. The structure can also be automated with actuators and controllers with solar power. The volume is designed to the pipe diameter which we typically do at 133 percent of the total."



### HDPE – Providing Sustainable Solutions

"In this project, and is typical for most of our projects now, we are actually completely replacing all existing tiles including the mains," Clark said.

"HDPE piping systems, with most ag pipes manufactured using recycled resin, are a sustainable and extremely environmentally responsible choice that will serve generations to come," stated Tony Radoszewski, CAE, president of PPI. "They are energy efficient during manufacturing and provide peak

protection from contamination during service. Plus, large diameter, corrugated HDPE pipe requires significantly less energy to fabricate, transport and install than metal or concrete alternatives. With superior resistance to corrosion and abrasion, plastics piping systems also supply long service life, excellent performance and can be recycled."

"When a grower realizes that their strongest return on farm spending is on tile drainage, then a light goes off in their head --- if it's a good investment on 200 acres, then it's a good investment on 2000 acres," Clark stated. "It's just simple math and common sense."

Additional information can be found at the PPI website, [www.plasticpipe.org](http://www.plasticpipe.org).'

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### About PPI:

*The Plastics Pipe Institute, Inc. (PPI) is the major North American trade association representing all segments of the plastic pipe industry and is dedicated to promoting plastic as the materials of choice for pipe and conduit applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in the development and design of plastic pipe and conduit systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods.*