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LEADING EDGE

Leading Edge, supported by the Society for Engineering in Agriculture and the Australian Centre for Precision Agriculture, provides a local and worldwide window on engineering and PA research.

What is PAM's future?

By Gary Alcorn

Soils ain't just soils and water ain't just waters – ask any irrigator. So in view of the countless variable interactions between these two resources is there any cost-effective universal agent which will guarantee their long and productive marriage?

After an exhaustive review of current research findings, soil researchers Dr Rabi Misra and Sarah Hood believe the additive, polyacrylamide (PAM), deserves at least a 'best man' or 'bridesmaid' role.

PAM is a long-chain hydrocarbon of high molecular weight synthesised from natural gas for a range of industrial and environmental uses.

In agriculture, PAM and other polymers are used as a soil conditioner similar to gypsum and lime but with other properties which interact positively with some soil particles and water molecules.

But PAM is a not a universal fix-it agent – no additive ever is.

"We believe best practice PAM use in the Australian irrigation industry is yet to be developed fully," Rabi said. "More specific area research is required to develop a consolidated code of practice for PAM use." (See panel opposite)

Sarah, as a former DPI Water Use Efficiency extension officer at St George and an Australian Cotton Industry Elders

Increasing siphon size may achieve the same result as using PAM.

BEST MANAGEMENT OF PAM FOR THE AUSTRALIAN IRRIGATION INDUSTRY

The use of PAM in irrigation fields to reduce erosion and/or manage infiltration characteristics should consider the following:

1. Establish what PAM is to be used for (such as, which modes of operation will dictate the dosage and management requirements).
2. Consider all options of treatment. There are several strategies that may achieve the same result as that being sought using PAM. For example:
   - Increasing siphon size and cutting water off before it reaches the end of the field may decrease infiltration and thereby increase water use efficiency and reduce erosion on some soils;
   - Wheat stubble can increase infiltration and reduce erosion on hard-setting red soils; and,
   - Increasing organic matter through green manure cropping or gypsum applications may stabilise surface structure of some other soils.

   A range of alternatives and/or a mix of approaches should be considered when designing remediation strategies.
3. Obtain a detailed soil description, particularly the infiltration characteristics of the soil before and after PAM use.
4. Assess and monitor irrigation water quality.
5. Measure the rate at which water is being delivered to the field.
6. Design PAM dosage after the information in steps one to five is analysed.
7. Collect enough data to assess the impact of PAM's use and so establish its economic and environmental benefit analysis. This is a logical step in considering the continued use of the product.

Use of PAM on farm dams and channels to mitigate seepage or evaporation

1. Understand that in relation to seepage and evaporation mitigation the theoretical basis and practical implementation are still being explored.

   In fact, PAM as an inhibitor of evaporation has not yet been investigated in farm dams and channels.

   If PAM is going to be used to reduce evaporation or seepage from farm dams and channels then growers will be required to design the method of application and an appropriate evaluation strategy.

   Dr Rabi Misra and Sarah Hood recommend growers seek assistance from specialists with the appropriate capacity in these areas.
2. Collect enough data to assess the impact of use and so establish both economic and environmental benefit analyses of PAM. This is a logical step in considering the continued use of the product.

Young Achiever, was responsible for the collation of the cotton industry's PAM usage and experiences in their joint report.

PAM in the cotton industry

"PAM usage in the cotton industry has peaked at approximately one in every five fields being treated for either increased infiltration on soils with surface sealing issues to reduced erosion," says Sarah.

"Experimental usage has occurred to understand the possibility of mitigating seepage and evaporation.

"The successful use of PAM requires a good understanding of how it works and the factors such as water quality, soil type and water quantity that dictate dosage rates.

"Ultimately the measurement of the effectiveness of the product to achieve the desired result is also lacking with most irrigators relying on anecdotal evidence to decide on continue usage of PAM," Sarah said.

The desktop review showed up to 20 per cent of Australian cotton farms used PAM annually for various purposes and with widely varying results.

"Using PAM to mitigate seepage and evaporation from dams and channels is an emerging and challenging opportunity being currently investigated by growers, PAM suppliers and researchers," Rabi said.

"But the scientific basis of using PAM to reduce evaporation and seepage is not known as well as that for field erosion and infiltration control and hence its practical application remains difficult.

"A collective effort is needed to better understand this area of opportunity. Supporting research, development and extension in this area would be of great strategic advantage for the cotton industry," Rabi said.

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Misra, R. and Hood, S. (2007). Desktop Review of Polyacrylamide use in the Australian Cotton Industry. National Centre for Engineering in Agriculture Publication 1002542, USQ, Toowoomba.

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Best practice use of PAM is still being developed for Australian irrigators.