Challenges Emerge for Trangie-Nevertire Irrigation Scheme's EPDM Liner

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Introduction:

The Trangie-Nevertire Irrigation Scheme (TNIS) in Central West New South Wales, Australia originally thought to be a ground-breaking success story now faces an unforeseen hurdle.

The irrigation scheme featuring the largest channel liner project in the world using GeoGard™ EPDM 1.1mm rubber geomembrane liner from Firestone (now Elevate from Holcim), aimed to reduce water loss and enhance efficiency.

However, multiple failures of the EPDM liner since 2022 have raised concerns among local farmers. This development puts the project at risk of becoming one of the largest failures of geosynthetic liners globally, given its immense scale and substantial investment.

A Promising Initiative:

In 2011, the Trangie-Nevertire Irrigation Scheme received funding through the Australian Government's Private Irrigation Infrastructure Operators Program (PIIOP). With an objective to save nearly 30,000 ML/year of water, the scheme invested in channel modernization, including the reshaping and lining of approximately 110 km of water delivery channels.

The Firestone GeoGard™ EPDM geomembrane was chosen from a variety of competitor products for its installation speed, durability, local support, and backing from a major multinational manufacturer.

The Scope and Scale of the Project:

Covering a vast expanse, the TNIS serves 66 farms and irrigates an area of 21,540 hectares. Its main channel extends over 209 km, with subsidiary delivery channels spanning 35.5 km. With a peak flow rate of 700 ML/day, the scheme facilitates the cultivation of a variety of crops, contributing to an annual additional production estimated to be worth $35 million AUD.

The project's construction budget included the supply and installation of the GeoGard™ EPDM liner, covering an extensive area of 2,197,571 square meters.

Initial Success and Pride:

Not long ago, Philip Moors, Managing Director of Holcim Solutions and Products EMEA, expressed his pride in completing the largest EPDM job to date, equating to covering 213 soccer fields.

"This is the largest EPDM job we have ever completed, equivalent to covering 213 soccer fields".

"It fills us with pride to be part of this success story and deliver a tangible, long-lasting solution to the local farming community"

Quotes by Philip Moors, Managing Director Holcim Solutions and Products EMEA (2020).

He highlighted the satisfaction of being part of a success story that delivers a durable solution to the local farming community. The ambitious TNIS project held promise as a shining example of effective irrigation infrastructure.

Recent Setbacks and Concerns:

However, the project's shining image began to fade in 2022 when multiple failures were reported by local farmers of the EPDM liner. The once-celebrated success story now faces the risk of becoming one of the most significant failures of geosynthetic liners globally. Given the sheer scale of the project, encompassing 143 km of lined channels and involving a construction cost of $67.9 million, addressing the failures becomes an urgent priority.

Tony Quigley, Mark Coulton and Jim Winter.

Tony Quigley is a cotton, grain and livestock producer based in the Trangie and Nevertire districts of central NSW

Mark Coulton Federal Member for Parkes

Jim Winter has farmed Carlisle, near Trangie, on the Macquarie west of Dubbo, since 1993 and Chair of the Trangie Nevertire Cooperative Ltd (TNCL) for 18 years

Investigation and Way Forward:

Experience with EPDM installations has shown that it has a tendency to shrink especially early in its exposed service life.

The scrim reinforced version of the material shrinks less than the unreinforced version and experienced installers will usually include provisions such as folded overlaps intended to absorb shrinkage and prevent the EPDM geomembrane from becoming stressed by the shrinkage.

The shrinkage of EPDM is caused by aging of the material after high UV (and heat) exposure. EPDM gradually shrinks as the temperature increases. Shrinkage (also called reversion) leads to dimensional changes that can put high stresses and strains on the installed liner. This shrinkage problem with EPDM has been known in the roofing industry for some time.

For instance, the 1997 paper by Paroli explains in detail the phenomenon, causes, prevention and remediation of shrinkage of EPDM roofing membranes. It appears the learning from the roofing industry were not translated to the channel lining field.

Ref. https://nrc-publications.canada.ca/eng/view/accepted/?id=287e830b-6347-4651-8711-95a8073f44d7

Shrinkage in EPDM geomembranes typically manifests in the form of dimensional changes such as contraction or tightening. This can lead to issues such as the separation of seams, reduced flexibility, and potential stress on the geomembrane.

To minimize the risk of shrinkage and associated problems, proper installation and maintenance are crucial. Here are a few measures that can help:

1. Adequate geomembrane size: Ensure that the EPDM geomembrane is appropriately sized during installation, accounting and compensating for any anticipated shrinkage;

2. Professional installation: EPDM geomembranes should be installed by experienced lining professionals who follow manufacturer guidelines and best practices.

3. Seam preparation and adhesion: Proper preparation and strong adhesion of seams are vital to prevent seam separation or opening due to shrinkage.

4. Regular inspections and maintenance: Regularly inspect the EPDM geomembrane lining system to identify any signs of shrinkage, stress, or damage. Prompt repairs or adjustments can help prevent further issues.

The reported failures would seem to indicate that the provisions made for shrinkage at TNIS were not sufficient for the extent of shrinkage experienced in the field on this project.

In light of the reported failures, a thorough investigation into the causes and potential remedies is necessary. Collaboration between project stakeholders, including farmers, engineers, manufacturers, and government agencies, will be crucial in determining the root causes and developing effective solutions. This process should prioritize both short-term fixes and long-term strategies to ensure the reliability and longevity of the channel lining.

Lessons for Future Projects:

The challenges faced by the TNIS project serve as a reminder of the inherent risks and complexities in large-scale infrastructure endeavours. Project planners, engineers, and policymakers should carefully assess and consider multiple factors, including material selection, installation techniques, quality control, and long-term performance predictions. The TNIS experience should prompt a re-evaluation of geosynthetic liner design, implementation, and monitoring processes to prevent similar setbacks in future projects.

Conclusions:

The Trangie-Nevertire Irrigation Scheme's EPDM liner project started with immense promise, aiming to revolutionize water delivery channels and enhance the efficiency of irrigation in the region. However, recent failures of the EPDM geomembrane liner have cast a shadow of doubt over the project's success. As stakeholders come together to investigate the causes and seek remedies, it is crucial to learn from this experience and apply the lessons to future endeavours.

Addressing the challenges faced by the TNIS project requires a comprehensive and collaborative approach. Experts from various fields must work together to identify the reasons behind the failures and develop effective solutions. This includes engaging with local farmers to understand their concerns and incorporating their feedback into the decision-making process.

Furthermore, there is a need for stricter quality control measures during the installation and monitoring phases of large-scale geomembrane liner projects. Laboratory testing, adherence to industry standards, and continuous monitoring

of the liners' performance are essential to ensure the durability and reliability of geomembranes.

While setbacks can be disheartening, they also present an opportunity for growth and improvement to be achieved as lessons are learned. The TNIS project can serve as a valuable case study for future irrigation and infrastructure initiatives.

By learning from the challenges faced by the TNIS, engineers, manufacturers, and policymakers can develop better strategies, guidelines, and protocols to mitigate risks and ensure the long-term success of similar projects.

In conclusion, the Trangie-Nevertire Irrigation Scheme's EPDM liner project started with great promise but now faces significant challenges due to reported failures. Addressing these issues requires collaboration, thorough investigation, and a commitment to learning from the experience. By applying the lessons learned from this project, we can enhance the success and sustainability of future geosynthetic liner projects, ensuring the efficient and responsible use of water resources in agricultural endeavours.