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Book Review

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Book review

Polymer Support Fluids in Civil Engineering

Carlos Lam and Stephan Jefferis, ICE Publishing, London, UK, 2018,
ISBN 978-0-7277-5786-9, £120.00, 312 pp.

Although polymer fluids are becoming increasingly common in foundation engineering, confidence in their use is not widespread and adequate knowledge of these materials is yet to disseminate beyond a relatively small number of specialists. In *Polymer Support Fluids in Civil Engineering*, Carlos Lam and Stephan Jefferis set out to address this.

Lam and Jefferis first introduce some terminology and basic concepts, and then present constraints and limitations associated with the use of bentonite as an excavation-supporting fluid, in particular with regard to environmental considerations and relatively onerous mixing and treatment plant requirements.

Following an explanation of the chemistry of polymers, the historical development of polymers for use in construction is presented, and past and present polymer fluid systems available from various suppliers are described. The chapter also introduces some of the additives that can be used in combination with polymer support fluids to perform certain functions (seal voids and fractures, improve excavation stability, control fluid loss, accelerate suspended solids settlement, treat used fluids).

The authors then discuss site equipment and procedures associated with the use of polymer support fluids: mixing, pumping, storage, cleaning, recycling and rejuvenation. Examples of current practice are provided, together with recommendations for the processes described and for excavations undertaken in high-groundwater conditions.

Important properties of polymer fluids and their testing are then considered, including dissolved solids, electrical conductivity, pH, water hardness, viscosity, density, sand content and residual polymer concentration. A later chapter in the book reviews in more detail the rheology of polymer support fluids.

The use of polymer support fluids in various countries as reported in available publications is then reviewed by Lam and Jefferis. This highlights that the decision to use polymer support fluids is often made only after preliminary pile testing, sometimes by comparison with bentonite or water. The review also illustrates the findings and recommendations presented

earlier in the book, with regard to the factors influencing the performance of foundations constructed with excavations supported by polymer fluid: salt concentration in the ground and the mixing water, polymer concentration, groundwater conditions and base cleaning. According to the authors, an appropriately designed polymer fluid system can be used to support excavations in gravelly materials, and the practice whereby a polymer support fluid with bentonite-laden mixing water is used should be avoided.

Lam and Jefferis then consider two projects in the UK in more detail. The Glasgow case study highlights the importance of appropriate equipment selection and use, and advocates relying on the self-cleaning properties of polymer support fluids to avoid the formation of a soft toe. The London case study compares the performance of piles constructed with bentonite or a polymer support fluid, concluding that using the latter results in a much stiffer load–settlement response, with no significant adverse effect on the stability of the pile bore when left open and supported by a polymer fluid overnight before concreting.

The final chapter concludes with site-based fluid control considerations regarding the specification of polymer support fluid systems. Lam and Jefferis support the guidance provided in the *ICE Specification for Piling and Embedded Retaining Walls*, 3rd edn (2017) (SPERW3). Although this was developed for bored piling works, the authors suggest that it can also be used for diaphragm wall construction by grab. An opportunity has been missed, however, to extend this and provide specification guidance suggestions for diaphragm walls constructed by hydrofracture or barrettes.

Overall, some readers may question certain aspects of *Polymer Support Fluids in Civil Engineering*, such as the arrangement of chapters, the depth of detail at which the authors present the chemistry of polymers and past and present polymer systems, and the absence of specification guidance on the use of polymer support fluids for foundation elements not covered by SPERW3. However, with this book the authors do provide an excellent guide to a ground engineering technology that remains relatively unknown and is not appreciated as it should be, beyond a relatively small number of geotechnical practitioners. The aim of this book is to change this situation; it worked for this reviewer, who highly recommends the book for those involved in the design and construction of foundation excavations.

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