

Griffith School of Engineering

7605ENG Industrial Affiliates Program

Final Project Report

The Flocculating Effect of Magnesium Chloride in a Magnapool™ System



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Executive Summary

In the wake of increasing stringency in the operating guidelines of the swimming pool industry, due to recent disease outbreaks and infections being linked with swimming pool water (Croll et al, 200; Glauner et al, 2005; Perkins, 200; Zwiener et al, 2007; WHO, 2006), Poolrite Research Pty Ltd. has patented a salt blend rich in magnesium chloride, which they believe, improves pool water quality by clarification. In the absence of hard facts to substantiate their marketing claim and to promote public acceptance of this hybrid system, Poolrite requested for independent research to be conducted by Griffith University to investigate the flocculating effect of magnesium chloride (MgCl₂) in a Magnapool™ System. This report outlines the concepts behind this study with details on all the investigative approaches (research and experimental), materials, methods and performance evaluation criteria used in assessing flocculation performance.

The process of ensuring water clarity as well as controlling the presence of pathogens in a swimming pool is crucial (Perkins, 2000). This can be achieved by the removal of suspended and colloidal matter in the pool water body so as to ensure bather safety from diseases by the removal of particles that shield micro-organisms from the action of disinfectants (WHO, 2006).

Flocculation has been defined as a process whereby destabilised or dispersed particles are brought together to form aggregate flocs of size, large enough to cause their settling and bring about clarification of the system. This process occurs by various mechanisms namely; adsorption and surface charge neutralization, sweep flocculation, electrical double layer compression and inter-particle bridging. The adsorption and surface charge neutralisation mechanism was found to be the mechanism by which most hydrolysing inorganic metallic salts, such as MgCl₂, flocculate. Thus, the two stages of the flocculation process according to Bratby, (2006) are the *Perikinetic flocculation* stage which ensues from thermal agitation, usually referred to as Brownian movement and is a naturally random process, and the *Orthokinetic flocculation* stage that starts immediately after flash mixing, due to induced velocity gradients that arise in the slow mixing regime, thereby causing increased particle contraction and consequent agglomeration of these particles.