Editorial

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Finite-element calculations of post-failure structural behaviour, offshore platform vibrations after ship collisions, and analytical formulae for steep periodic waves in deep, moderate and shallow water depth, including cnoidal waves, are the topics of this issue of *Engineering and Computational Mechanics*.

The issue starts out with a briefing by Dameron (2012) that discusses the increase of finite-element calculations in fracture mechanics (e.g. Janssen *et al.*, 2004; Anderson, 2005), particularly the predictions of post-failure structural conditions, for pressure-retaining structures. Dameron writes that there are two fundamental types of failure criteria – strain-based and fracture-based – where the latter may represent a superior methodology because, in addition to onset of failure, they guide the prediction of rupture size, while failure type criteria do not. Failure-based criteria have another weakness relating to grid-sensitivity.

Offshore oil and gas platforms are repeatedly visited by vessels. They make the rigs vulnerable to collisions and subsequent damage (e.g. Zeinoddini, 2011). Ship collision loads on small offshore platforms are discussed in the first paper (Grewal and Lee, 2012), particularly the time-oscillations of the platform and which structural modes are triggered. Time-series collision pulse loads are analysed and compared to loads of sine-form and of rectangular shape – the collisions last from 1 to 3 seconds. Four different types of platform are analysed: braced caisson, four-pile jacket, monotower and Vierendeel.

Strong waves in deep (e.g. Grue and Jensen, 2012), intermediate (e.g. Zhang and Schäffer, 2007) and shallow water (e.g. Fenton, 1979) are of interest to engineering applications relating to offshore platforms and renewable energy at sea, such as offshore wind turbines. Strong, periodic waves in various water depths, ranging from deep to shallow water, are discussed in the final two papers (Sobey, 2012a, 2012b). The author revisits and generalises the classical theories of steep Stokes waves and cnoidal waves.

Limits and overlaps of the theories are discussed. The wave-induced velocities in the very strong waves are evaluated.

REFERENCES

- Anderson TL (2005) *Fracture Mechanics – Fundamentals and Applications*, 3rd edn. CRC Press (Taylor & Francis), Boca Raton, Florida, USA.
- Dameron RA (2012) Predicting ‘post-failure’ structural condition in pressure-retaining structures. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **165**(3): 159–161, <http://dx.doi.org/10.1680/eacm.11.00011>.
- Fenton JD (1979) A high-order cnoidal wave theory. *Journal of Fluid Mechanics* **94**(1): 129–161.
- Grewal GS and Lee MMK (2012) Spectral analysis of minimum structure platforms. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **165**(3): 163–179, <http://dx.doi.org/10.1680/eacm.10.00003>.
- Grue J and Jensen A (2012) Orbital velocity and breaking in steep random gravity waves. *Journal of Geophysical Research* **117**: C07013, <http://dx.doi.org/10.1029/2012JC008024>.
- Janssen M, Zuidema J and Wanhill RJH (2004) *Fracture Mechanics*, 2nd edn. Spon Press, Abingdon, UK.
- Sobey RJ (2012a) Steep progressive waves in deep and shallow water. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **165**(3): 181–200, <http://dx.doi.org/10.1680/eacm.10.00013>.
- Sobey RJ (2012b) A cnoidal approximation wave theory. *Proceedings of the Institution of Civil Engineers – Engineering and Computational Mechanics* **165**(3): 201–216, <http://dx.doi.org/10.1680/eacm.11.00013>.
- Zeinoddini M (2011) *Design of Offshore Oil/Gas Platforms Against Ship Impacts*. LAP Lambert Academic Publishing, Germany.
- Zhang H and Schäffer HA (2007) Approximate stream function wavemaker theory for highly non-linear waves in wave flumes. *Ocean Engineering* **34**: 1290–1302.