

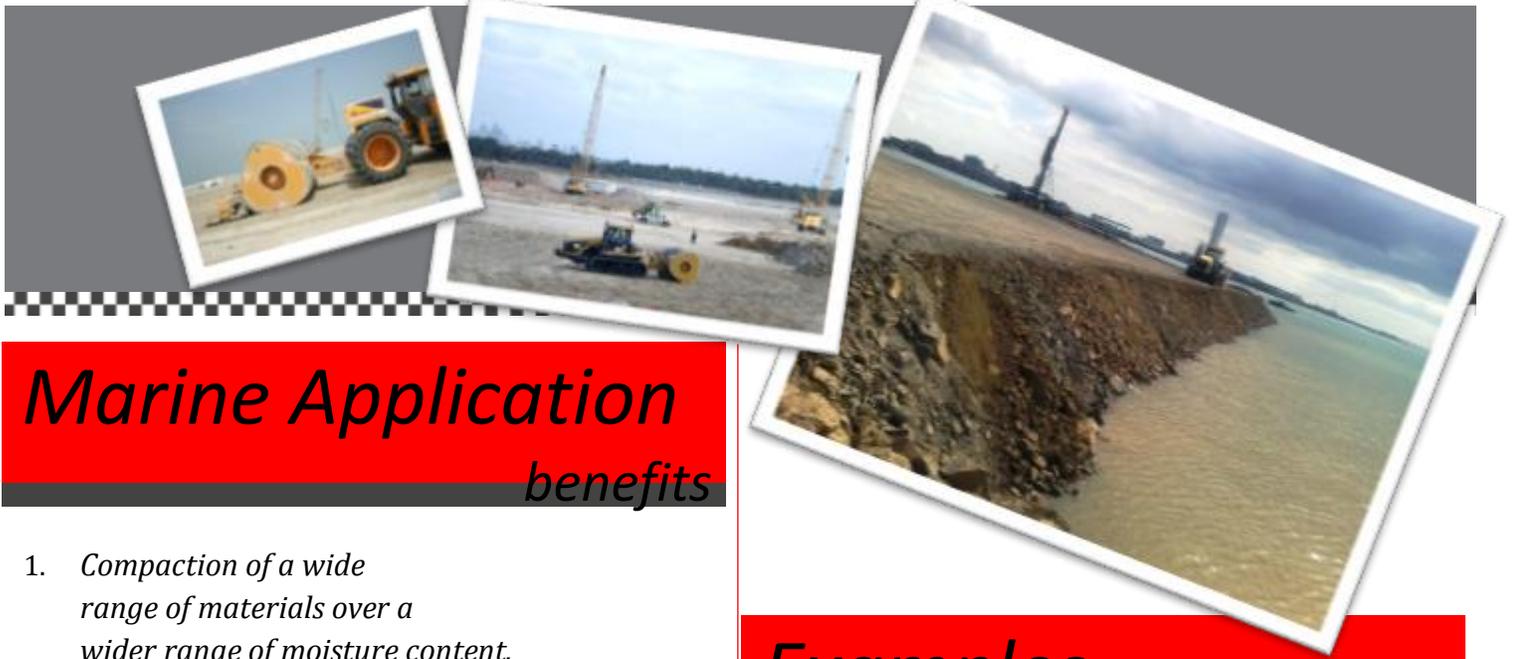
*Alternative and unique controlled solutions to ground improvement in infrastructure, mining and marine applications.*



## Features of HEIC

1. *Compaction forces of between 1200kN and 2500kN.*
2. *Ability to compact material to a higher maximum dry density and over a wider range of moisture conditions, particularly dry of optimum moisture content.*
3. *Ground improvement is typically measured to effective depths of 2m-3m with depths of up to 5m being recorded in some applications.*
4. *This extended load transfer duration leads to a softer soil response to the load and hence an enhanced soil compressibility is achievable.*
5. *The relatively high operating speed and depth of influence of the Landpac HEIC process leads to very high productivity of compaction. The HEIC process can typically cover 15,000m<sup>2</sup> per hour per surface coverage. The productivity of the Landpac HEIC process can be between 2 and 5 times higher than that of conventional shallow compaction equipment when performing fill works and many times more productive than that when it comes to the improvement of in-situ material.*



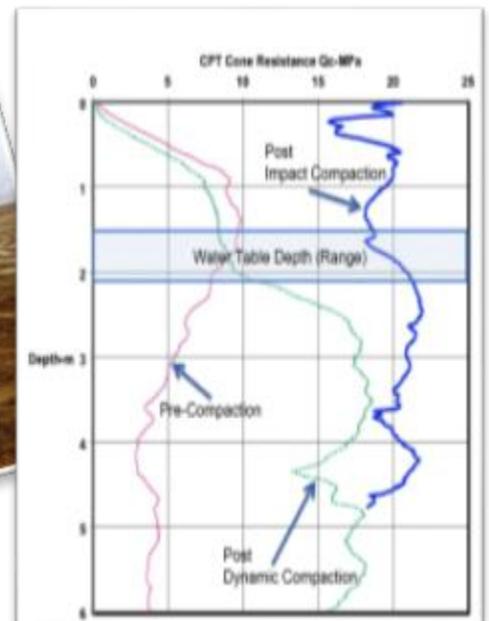


# Marine Application benefits

1. *Compaction of a wide range of materials over a wider range of moisture content.*
2. *Deep in-situ impact compaction, with effective depths ranging from 2.5 to 4m, may eliminate the need to excavate and replace in thin layers.*
3. *Opportunity to combine the technologies of high energy impact compaction with dynamic compaction (DC) and vibro compaction (VC) / vibro flotation (VF). This addresses the disturbed top 1 to 3m experienced with the use of very deep compaction technologies.*
4. *Thick lift layerworks (800-1000mm) as opposed to traditional thin layers (150-250mm).*
5. *Improved productivity; up to 10 times more volume per shift, compared to conventional thin layer compaction.*

# Examples of typical benefits

- *Fine to medium grained marine sands with lenses containing organic and clay; Dynamic Compaction and HEIC combined.*
  - *Average Cone Resistance ( $Q_c$ ) improved from an average of less than 8MPa post dynamic compaction to an average exceeding 15MPa post HEIC in the top 2m.*
  - *Cone resistances exceeding 20MPa were recorded between 2 and 4m, post HEIC treatment.*





- *Fine grained marine sands at 4-4.5% below optimum moisture content (OMC=12.5%); Vibro Compaction and HEIC combined.*
  - *Significant increases in consistency with improvement recorded up to 5.0m deep, with the largest improvement was recorded in between 0.5m and 2.0m.*
  - *The weighted average  $Q_c$  recorded in the top 2.0m improved from 4.7 MPa to 11.6 MPa after completion of 40 passes.*
  - *The weighted average  $Q_c$  over 4.8m depth improved from 8.9 MPa before compaction commenced, to 13.6 MPa after completion of 40 passes.*

- *Coarse grained marine sand; Vibro Compaction and HEIC combined.*
  - *CPTU results indicated  $Q_c$  values  $\geq 10$ MPa to the required depth of 2m below ground level, with similar improvement experienced between 3 and 5m in some sections.*
  - *Plate load tests indicated  $E_{v2}$  values ranging from 107 to 145 MPa, exceeding the specification requirements of 100 MPa at the surface.*
  - *$E_{v2}/E_{v1}$  ratios ( $k$ ) ranged between 1.72 and 2.0.*

