

HULKEN

TECHNOLOGIES PTE. LTD.



THERMAL ENERGY STORAGE SOLUTIONS

ENGINEERING / FABRICATION / INSTALLATION / INTEGRATION

Product & Capability Catalogue | Concept Edition

Singapore | Thermal Energy Storage Solutions

Concept imagery; not photographs of completed HULKEN projects.

COMPANY PROFILE & TES PRODUCT RANGES

Integrated TES solutions

A single engineering partner across the thermal storage project lifecycle

HULKEN TECHNOLOGIES PTE. LTD. is a Singapore-based company established in 2022, focused on chilled-water Thermal Energy Storage (TES) systems. Services include engineering, equipment sourcing, fabrication coordination, site assembly, project integration, testing and commissioning.

APPLICATIONS

Data centres | District cooling | Commercial buildings | Industrial plants | Campus cooling

TWO TES PRODUCT RANGES

01 FACTORY-ASSEMBLED TES TANKS

1 to 100 m³

Factory-fabricated and assembled tanks delivered as complete units, subject to transport limits, pressure requirements and site access.

02 SITE-ASSEMBLED LARGE TES TANKS

Above 100 m³

Shell plates or prefabricated sections delivered for site erection, welding, internal installation, testing and commissioning.

100 m³ is included in Part 01; capacities above 100 m³ are in Part 02.

ENGINEERING & DELIVERY

From concept to commissioning

Project-specific engineering, verification and quality documentation

01

Design basis

Load profile, chilled-water temperatures, storage hours and capacity.

02

Engineering

Tank geometry, hydraulic sizing, diffuser layout and structural interfaces.

03

Fabrication

Approved materials, welding procedures, inspection and traceability.

04

Site erection

Lifting plans, welding, testing, insulation and interface coordination.

05

Commissioning

Functional checks, temperature stratification and performance verification.

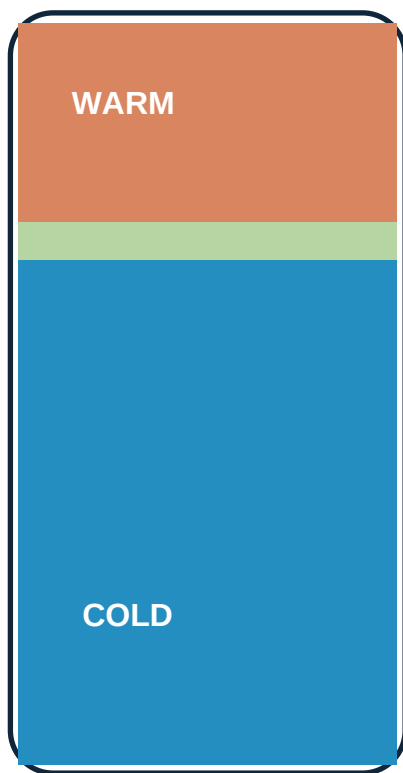
CFD, FEA and third-party testing may be included where required and contracted.

TES TECHNOLOGY

How chilled-water TES works

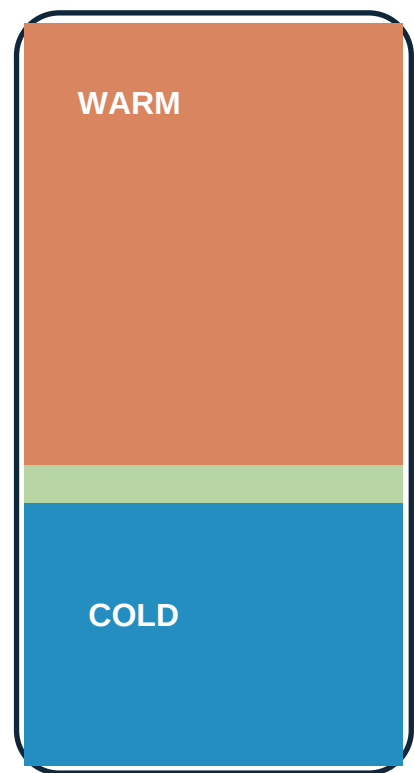
Stratified storage uses the temperature-density difference of water

CHARGING



Low-mixing diffuser

DISCHARGING



Low-mixing diffuser

During charging, cold water enters the lower region while warmer water exits above. During discharging, cold water supplies the cooling load while warm return water enters above.

Thermocline stability depends on diffuser hydraulics, geometry and operating flow.

APPLICATIONS

Where TES creates value

Design objectives vary by project; not every cooling system requires TES



Data centres

Short-duration cooling ride-through where specified; thermal buffering and resilience.

District cooling

Shift cooling production and reduce demand peaks where tariffs and plant configuration support it.

Industrial & commercial

Manage load variability, chiller staging and cooling capacity constraints.

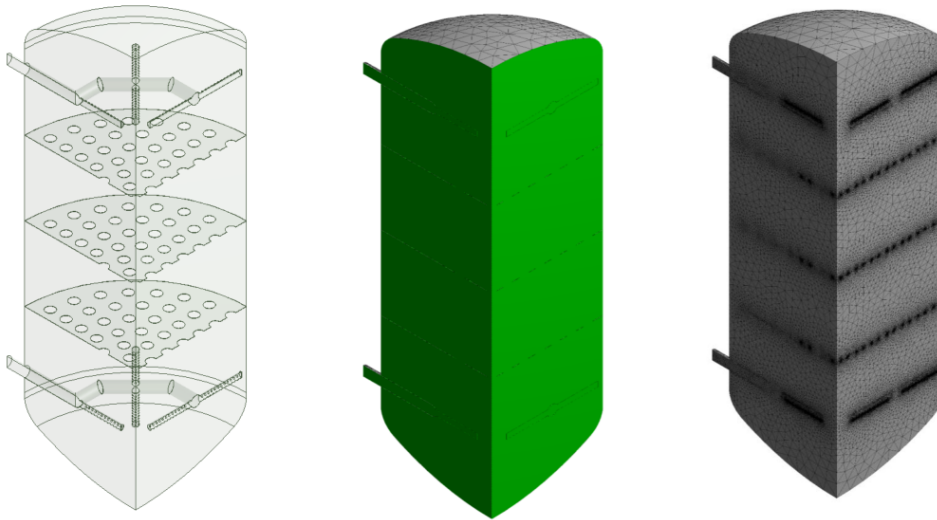
ENGINEERING ANALYSIS | CFD

CFD simulation for TES tank design

Flow distribution, thermal stratification and diffuser evaluation

Computational Fluid Dynamics (CFD) can support TES tank design by modelling temperature and water-velocity fields under defined operating conditions.

MODEL & MESH



Example simulation: quarter-symmetry fluid domain with approximately 10 million mesh cells; reported mesh quality above 0.4. Realizable k-epsilon turbulence model.

CASE-STUDY INPUTS

Reported flow rate: 5.583 L/s; transient simulation: 3,600 seconds, 5-second steps.

Reported temperature boundary conditions include 8.5 C, 9 C and 15 C.

The two operating directions are illustrated on the following page.

WHAT CFD HELPS ASSESS

- Diffuser outlet velocities and local recirculation zones
- Mixing, thermocline behaviour and outlet-temperature variation
- Potential changes to inlet/outlet and internal baffle arrangements

Illustrative reference analysis only. CFD outcomes depend on geometry, boundary conditions, numerical settings and project-specific validation.

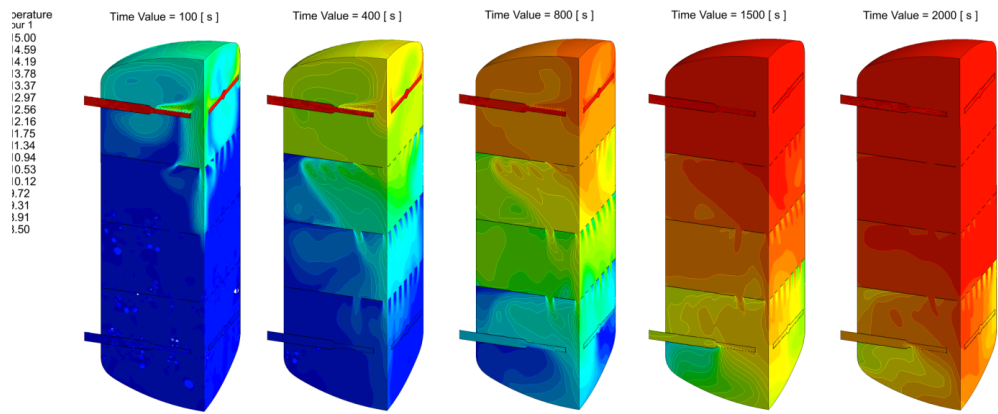
Source: CFD report - 173A (technical case study; design-specific results).

ENGINEERING ANALYSIS | CFD RESULTS

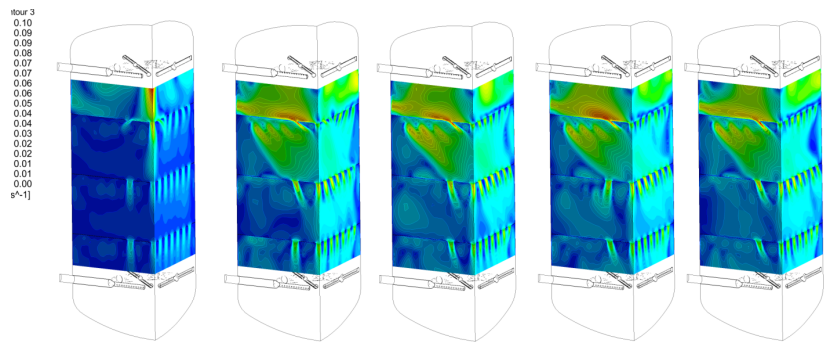
Temperature & velocity fields

Illustrative transient CFD outputs from the supplied case study

WARM-WATER ENTRY / COLD-WATER WITHDRAWAL

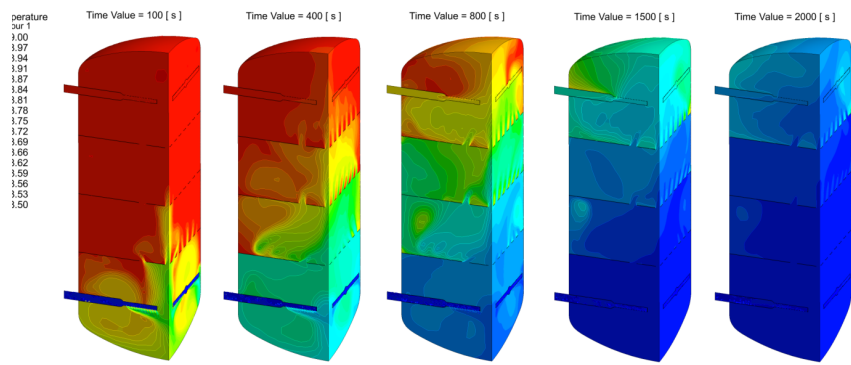


Temperature contours at successive times (100 to 3,600 seconds)



Velocity contours highlight local acceleration at distribution openings.

COLD-WATER ENTRY / WARM-WATER WITHDRAWAL



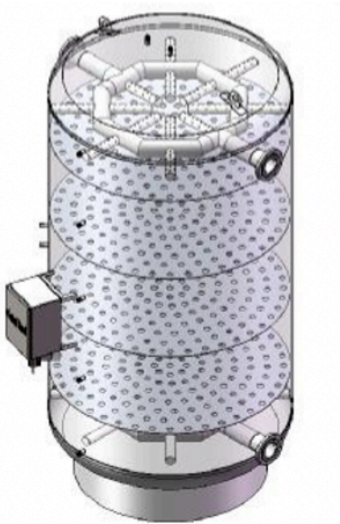
The report identifies mixing and local vortices; the illustrated results do not establish a guaranteed thermocline thickness or TES performance rating.

Source: CFD report - 173A (technical case study; design-specific results).

TES TECHNOLOGY

How thermal energy storage works

Sensible heat storage for cooling and heating applications



- ▶ Stores sensible energy of water in the form of thermal energy
- ▶ Employed in situations where there is imbalance between energy supply and demand (peak shaving) or as backup
- ▶ Applicable in both heating and cooling purposes

KEY APPLICATIONS

● Peak shaving

Shift cooling production to off-peak periods and discharge during peak demand.

● Demand balancing

Reduce the mismatch between cooling generation and building load.

● Operational resilience

Provide stored cooling capacity for short-term backup where designed.

FACTORY-ASSEMBLED TES TANKS

Compact, high-quality, ready for delivery and installation

Factory-assembled TES tanks from 1 m³ to 100 m³ are designed and fully fabricated in a controlled factory environment, ensuring high quality, shorter on-site installation time and reliable performance.



Vertical Type
(1 – 100 m³)

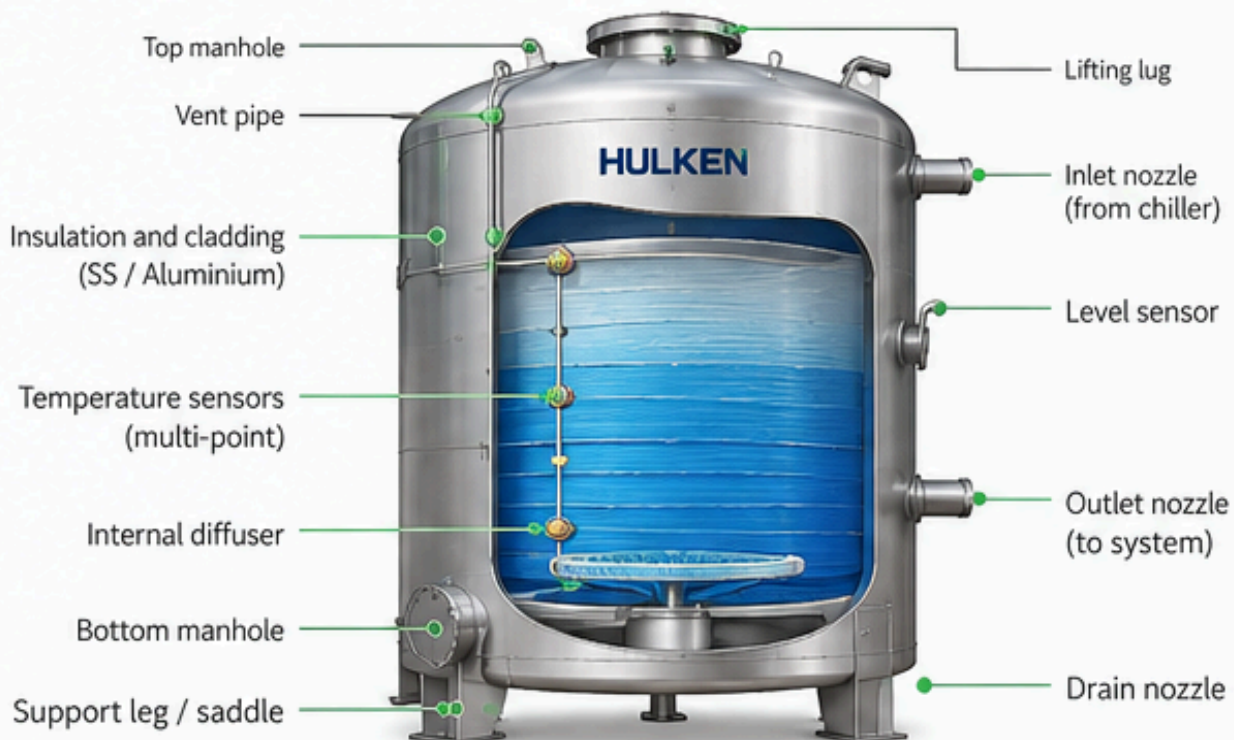


Horizontal Type
(1 – 100 m³)



Multiple Tanks in Parallel
(Scalable Capacity)

TYPICAL CONFIGURATION



PART 1

TES RANGE 1 m³ – 100 m³

MODEL SELECTION TABLE (FACTORY-ASSEMBLED)

Model	Nominal Capacity (m ³)	Vertical Type (Typical)			Horizontal Type (Typical)		Estimated Empty Weight (kg) (Vertical / Horizontal)
		Diameter (m)	Straight Shell Height (m)	Overall Height (m)	Diameter (m)	Length (m)	
HK-FA-001	1	1.0	1.5	1.8	1.0	1.6	450 / 480
HK-FA-002	2	1.2	1.8	2.1	1.0	2.6	600 / 650
HK-FA-003	3	1.4	1.8	2.2	1.2	2.8	750 / 800
HK-FA-005	5	1.6	2.4	2.8	1.4	3.5	1,000 / 1,100
HK-FA-010	10	1.8	3.5	4.0	1.6	5.0	1,800 / 1,950
HK-FA-015	15	2.2	3.8	4.4	1.8	6.0	2,400 / 2,600
HK-FA-020	20	2.5	4.0	4.6	2.0	6.5	2,900 / 3,100
HK-FA-030	30	2.8	5.0	5.8	2.2	8.0	4,000 / 4,300
HK-FA-040	40	3.0	5.8	6.6	2.5	8.5	5,200 / 5,600
HK-FA-050	50	3.2	6.2	7.0	2.8	9.0	6,300 / 6,800
HK-FA-060	60	3.4	6.8	7.8	3.0	10.0	7,500 / 8,000
HK-FA-070	70	3.6	7.0	8.0	3.0	11.0	8,600 / 9,200
HK-FA-080	80	3.8	7.2	8.4	3.2	11.5	9,800 / 10,500
HK-FA-090	90	4.0	7.5	8.8	3.2	12.5	11,000 / 11,800
HK-FA-100	100	4.2	7.8	9.2	3.5	13.0	12,500 / 13,500

Notes:

1. Dimensions are typical values for reference only. Final design to be confirmed based on project requirements.
2. Tanks are designed for chilled water storage at near-atmospheric pressure or low internal pressure.
3. Material, insulation thickness, nozzle size and arrangement can be customized.
4. Vertical or horizontal configuration to be selected based on site space, transportation and project requirements.

TES INTERNALS

Diffusers, baffles & instrumentation

Engineering for stable thermal stratification and measurable performance



Diffuser systems

Low-velocity inlet/outlet distribution designed to limit mixing and preserve the thermocline.

Baffle arrangements

Where justified by hydraulic analysis, baffles can guide internal flow and limit short-circuiting.

Sensors & controls

Vertical temperature sensor arrays, level/pressure monitoring, flow meters and BMS interfaces.

PART 01 | FACTORY ASSEMBLED

Factory-assembled TES tanks

Nominal capacity range: 1 m³ to 100 m³



Product configurations

Vertical and horizontal cylindrical tanks, customised to design pressure, temperature, nozzle orientation, access, insulation and instrumentation requirements.

Factory scope

Shell and head fabrication; nozzles and supports; TES diffusers and internals; welding inspection; factory tests as specified; delivery to site.

2027-2028: partner-factory production. Johor in-house facility planned from 2029.

PART 2 | Site-Assembled TES

Custom-engineered large tanks above 100 m³

Large TES tanks are fabricated as transportable sections and assembled at site.

Nominal capacities shown below are examples for preliminary enquiry only.

Model code	Nominal capacity	Tank arrangement	Delivery / assembly
HK-SA-150	150 m ³	Vertical / custom	Site assembled
HK-SA-200	200 m ³	Vertical / custom	Site assembled
HK-SA-300	300 m ³	Vertical / custom	Site assembled
HK-SA-500	500 m ³	Vertical / custom	Site assembled
HK-SA-1000	1,000 m ³	Vertical / custom	Site assembled
HK-SA-CUSTOM	Above 1,000 m ³	Project-specific	Site assembled

Engineering information required for selection

- Design supply / return temperatures and required storage duration
- Peak flow rate, charge/discharge duty and available plantroom or site footprint
- Atmospheric or pressurised duty, material and corrosion requirements
- Diffuser / baffle arrangement, insulation, instrumentation and testing scope
- Site access, lifting constraints, design codes and approval requirements

IMPORTANT - PRELIMINARY CATALOGUE MODELS

These are proposed HULKEN model identifiers, not certified standard products.

No pressure rating, dimensions, manufacturing certification or tested performance is implied. Final specifications are confirmed through project engineering.

PROJECT REFERENCE

Singapore Data Centre 100 m³ TES Tank

Horizontal chilled-water thermal energy storage tank installation



Insulated tank - installed condition



Tank body and supports - installation reference

Photographs provided as a project reference; project delivery attribution not stated.

PROJECT REFERENCES

Data centre TES installations

Singapore | Vietnam | Indonesia



Singapore - data centre TES

Two 70 m³ closed chilled-water storage tanks.



Vietnam - data centre cooling

One 25 m³ and one 75 m³ closed chilled-water storage tanks.



Indonesia - data centre cooling

Closed pressurised chilled-water storage tank; 3.3 m diameter × 5 m length.

CONTACT

Let us engineer your TES solution

Technical enquiries, preliminary sizing and project collaboration

HULKEN TECHNOLOGIES PTE. LTD.

Singapore

General enquiries

info@hulkentech.com

Sales & project enquiries

sales@hulkentech.com

Website: hulkentech.com

Please provide required TES capacity (m3 or MWh), supply and return temperatures, design flow, available site dimensions, design code, installation location and operating objectives.

CONCEPT EDITION - October 2026

Reference catalogues were used for subject matter and structure only