

FROST & SULLIVAN  
**BEST PRACTICES**



2026

**APAC ZERO LIQUID  
DISCHARGE**

**CUSTOMER VALUE  
LEADERSHIP**



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## Best Practices Criteria for World-class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each recognition category before determining the final recognition recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Thermax excels in many of the criteria in the ZLD space.

RECOGNITION CRITERIA	
<i>Business Impact</i>	<i>Customer Impact</i>
Financial Performance	Price/Performance Value
Customer Acquisition	Customer Purchase Experience
Operational Efficiency	Customer Ownership Experience
Growth Potential	Customer Service Experience
Human Capital	Brand Equity

## The Transformation of the Zero Liquid Discharge Industry

Zero liquid discharge (ZLD) and advanced water treatment systems have emerged as a critical solution in

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**- Paul Hudson**  
**Senior Industry Analyst, Sustainability & Circular Economy**

the Asia Pacific (APAC) industrial water landscape, driven by escalating water scarcity, tightening environmental regulations, and rising environmental, social, and governance (ESG) mandates. Yet despite its promise, ZLD adoption remains fraught with challenges. The region’s rapid industrialization, especially growth in sectors like chemicals, textiles, power, and pharmaceuticals, has Intensified pressure on freshwater resources leading to water scarcity and limitation on freshwater withdrawal, to have strict Pollution control boards (PCB) norms for Zero Liquid Discharge, to reduce the dependency on freshwater. However, ZLD systems are capital-intensive, energy-hungry, and operationally complex. Conventional

designs often require large footprints, skilled labor, and high operating costs, making them inaccessible for many mid-sized facilities.

In APAC, where cost sensitivity and space constraints are common, the final stages of ZLD (evaporation and crystallization) pose the greatest hurdles. These processes demand robust thermal engineering and precise pretreatment to avoid scaling, downtime, and excessive energy consumption. Moreover, the lack of standardization across deployments leads to long commissioning cycles and unpredictable performance. As industries seek to balance compliance with economic viability, the need for energy-efficient and digitally-enabled standardized ZLD solutions has never been more urgent. Companies that can deliver these outcomes, while ensuring lifecycle reliability and customer-centric service, are poised to lead the next wave of sustainable water management in the region. Thermax has developed an advanced technology to treat and purify solids/salts generated from ZLD systems. This enables **Zero Solid Discharge (ZSD)** through effective resource recovery, transforming salts into reusable resources and supporting a true circular economy.

### Breakthroughs in Thermal Efficiency and Modular Innovation

Thermax reframes the economics of ZLD by translating deep thermal engineering into measurable customer value. At the core is a differentiated evaporation portfolio, including multi-effect evaporation, brine concentration and mechanical vapor recompression, that achieves industry-leading energy performance of roughly 40-45 kilowatt-hour per kiloliter of effluent treated, directly attacking the largest operating-cost driver in ZLD. The company's advanced mechanical vapor recompression (MVR) solution, VapoNova<sup>e+</sup>, VapoNova<sup>e+</sup> operate without any external steam input and multi-effect evaporator (MEE) system, StemNova<sup>s+</sup> operates with minimum steam consumption giving best steam economy using adiabatic evaporator, reducing/removing fuel supply dependencies and enabling plants to align compliance requirements with sustainability, OPEX and cost goals rather than trading one off against the other.

Thermax's VapoNova<sup>e+</sup> delivers significant sustainability and operational benefits for industrial wastewater management. The solution achieves 40% energy savings and a 40% smaller footprint compared to conventional ZLD systems, while eliminating the need for boilers and external steam, reducing CO<sub>2</sub> emissions, and lowering operating costs.<sup>1</sup> It offers fully automated and modularized skid mounted, plug n- play unit with Internet of Things (IoT)-enabled PADO system (Performance analysis and data optimization). This proactively predicts CIP frequency enabling longer operation time. With two phase close-loop system (patented technology) for uniform heat load distribution ensures reliability and efficiency. Designed for capacities from 2 kiloliters daily (KLD) to 600 KLD, the system produces clear condensate (less than 250 parts per million dissolved solids) and solid end products with less than 10% moisture, serving diverse industries such as pharmaceuticals, textiles, chemicals, automobiles, steel, PCB, solar, chemical, agrochemical, tanneries, distilleries and power.<sup>2</sup> Likewise, its StemNova<sup>s+</sup>, Thermax's multi-effect evaporator enables industries to recycle wastewater efficiently while meeting stringent discharge norms. The system offers about 40% lower steam requirement compared to other manufacturers, zero make-up water for cooling towers, and reduces downtime from 20 hours to less than 6 hours per week.<sup>3</sup> With a compact footprint, patented non-scaling preheater design, and capacity range

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<sup>1</sup> Provided by Thermax.

<sup>2</sup> Provided by Thermax.

<sup>3</sup> Ibid.

from 5 cubic meters/day to all capacities as per customer requirement, it delivers energy-efficient performance and high uptime.

Equally important is the way Thermax overcomes ZLD's long commissioning cycles and unpredictable performance through modularizing MVR and MEE solutions. As a result, its advanced VapoNova<sup>es+</sup> and StemNova<sup>es+</sup> systems package arrives largely pre-engineered and VapoNova<sup>es+</sup> can be commissioned in about a week, compressing time-to-benefit and minimizing site-execution risk.<sup>4</sup> This product posture replaces fragile, one-off project engineering with predictable, repeatable building blocks, an approach that stabilizes budgets and schedules for customers that run tight production windows.

Furthermore, Thermax designs its ZLD solutions with material and design choices that are resistant to scaling, corrosion and fouling, preserving system uptime and lifecycle economics. By pairing application-appropriate metallurgy with proprietary thermal configurations, the company extends typical jet-cleaning intervals from the industry's every few months cadence to approximately 12 to 18 months. Fewer shutdowns and third-party service mobilizations, and lower thermal stress across the Heat Transfer Area (HTA) translate into more consistent output quality and a smoother operating expenditure curve over the asset life.

Thermax's platform and configurator strategy further underpins its price/performance leadership. Customers select from pre-engineered modules calibrated to influent characteristics and recovery targets, gaining the feel of customization without the cost drift and design churn that typically erode return on investment (ROI). Guard-railed choice ensures technical fit while preserving manufacturing and delivery efficiencies, keeping solutions performant and economically disciplined. Thermax's 60+ years of rich and diversified experience in Heat and Mass transfer and water chemistry sets it apart as a credible ZLD OEM as compared to conventional players.

These technical and architectural decisions are reinforced by a growing patent base covering heat-exchanger layouts, pre-heating schemes, and geometry choices that improve heat and mass transfer behavior under challenging wastewater compositions (i.e. effluent). The result is defensible differentiation that is difficult to replicate through incremental tweaks alone.

Taken together, Thermax converts ZLD from a compliance burden into recycling / resource recovery based bankable operating asset. Customers receive systems that start faster, run longer between interventions, require minimum manpower for operation and consume relatively less energy, per unit of water recovered. These quantifiable advantages position the company at the forefront of APAC's ZLD sector.

### **Run-Rate Reliability at Scale: Digitally Enabled, Lifecycle-Optimized ZLD**

Thermax delivers operational efficiency in ZLD through a digitally enabled platform model that minimizes lifecycle costs and maximizes uptime. Its Edge Live platform enables continuous remote monitoring and predictive maintenance across more than 300 operations and maintenance (O&M) sites, ensuring proactive interventions and reducing unplanned downtime. This fleet-wide intelligence translates into real-world run-rate performance, with dosing optimization and vibration/infrared cues that preempt mechanical failures.

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<sup>4</sup> Ibid.

Thermax's configurator-driven design and modular skid systems further accelerate engineering throughput. This approach reduces rework and delivery cycles, contributing to a more than 90% on-time performance rate for standardized ZLD modules.<sup>5</sup> Customers benefit from faster deployment and consistent quality, even in complex effluent scenarios.

Thermax optimizes energy use by balancing pretreatment loads and selecting the appropriate evaporation technology (multi-effect evaporator versus mechanical vapor recompression), minimizing the energy footprint of ZLD trains. This optimization reduces operating expenses and extends component life by lowering thermal stress and scaling risks.

Moreover, Thermax's Biofilter Pro with ThermFlux is a compact, eco-friendly wastewater treatment solution that combines advanced biofiltration and tubular ultrafiltration membrane technology to deliver high treatment efficiency and superior removal of organic pollutants, solids, and pathogens. This hybrid

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system ensures sustainable operation and cost-effectiveness, making it ideal for modern facilities and industrial applications where space and performance are critical. As such, Biofilter Pro empowers the company to expand coverage and offer end-to-end coverage, providing high-quality effluent for diverse wastewater treatment needs. Post-installation efficiency is supported by digital documentation and parts traceability. Customers access drawings, manuals, and spare inventories via Edge Live, streamlining maintenance and reducing average time-to-repair. This self-service capability empowers plant teams and reduces reliance on external support.

Thermax also ensures process flexibility, with solutions like blower-less aerobic treatment that handle seasonal or variable loads without

compromising output quality. This adaptability reduces off-specification events and operator burden, reinforcing the company's reputation for robust, low-touch systems.

Together, these elements demonstrate Thermax's cohesive operational efficiency that spans design, deployment, and lifecycle management, delivering measurable value and reinforcing the company's leadership in scalable, reliable ZLD solutions.

### **A Customer-centric ZLD Journey from First Quote to Full Lifecycle**

Thermax architects a customer experience model that spans the full lifecycle, from purchase to ownership to service, ensuring ZLD solutions are not only technically sound but also commercially accessible and operationally seamless. At the purchase stage, the company's guided configurator and proposal automation tools enable fast, transparent techno-commercial offers. Customers can explore tailored configurations within standardized platforms, balancing customization with cost predictability. This

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<sup>5</sup> Provided by Thermax during interview.

“customized standardization” accelerates decision-making and builds trust by highlighting trade-offs, pricing, and delivery timelines. Channel partners benefit from the same configurator logic, allowing Thermax to scale its reach without compromising solution integrity. This consistency ensures consistent experiences across geographies and sales channels, which is critical in complex industrial procurement.

Thermax’s ownership experience is enhanced through rapid commissioning and digital enablement. Its VapoNova<sup>e+</sup> and StemNova<sup>s+</sup> units modularity support fast deployment, reducing time-to-benefit and minimizing on-site disruption. Post-installation, customers gain access to Edge Live portals that house documentation, drawings, and spare part inventories, streamlining operations and empowering plant teams with self-service capabilities. By embedding analytics, predictive maintenance, and remote operations into the service layer, the company transitions from a project vendor to a lifecycle partner. This model enhances retention, drives upsell opportunities, and reinforces the brand’s credibility as a long-term value creator.

The customer service experience is elevated through Thermax’s O&M partnership model, which integrates IoT-driven nudges, predictive maintenance, and chemical dosing optimization. These features reduce operating costs and de-risk compliance and performance for environment, health, and safety and operations heads. The company’s responsiveness is further demonstrated in retrofit scenarios, where delivers turnaround times of about five months, significantly faster than competitors, thereby reinforcing its reputation for execution agility.

Thermax also invests in customer education and engagement through gamified product visualization tools, helping demystify complex ZLD systems and improve pre-sales understanding. This approach reduces the perception gap and enhances confidence in solution fit.

By integrating configurability, digital enablement, and lifecycle partnerships, Thermax delivers a customer experience that is frictionless, transparent, and value-driven.

### **Thermax’s Strategic Rise in ZLD Leadership**

Thermax’s growth trajectory in ZLD is driven by a strategic pivot toward wastewater treatment, which now comprises approximately 70% of its water business mix.<sup>6</sup> This shift aligns with intensifying regulatory pressures, industrial water scarcity, and ESG mandates across APAC, positioning the company at the center of rising demand and capital allocation.

The company’s multi-industry footprint, including metals, food and beverage, pharmaceuticals, chemicals, and automotive, demonstrates its ability to scale ZLD solutions across diverse influent profiles and compliance regimes. This breadth de-risks exposure to sectoral cycles and enables cross-sell of standardized modules and digital services, reinforcing customer lifetime value.

Thermax’s brand equity is further strengthened through strategic partnerships and acquisitions. Its collaboration with NX Filtration brings advanced ultrafiltration and nanofiltration capabilities, enabling readiness for emerging micro-pollutant and per- and polyfluoroalkyl substances regulations. Its partnership with TSA Process Equipments adds high-purity water expertise, expanding the company’s

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<sup>6</sup> Provided by Thermax during interview.

relevance in semiconductor and pharmaceutical segments with stringent water quality demands and high growth potential.

Market momentum is evidenced by the company's reported compound annual growth rate of approximately 25% to 28% over the past five years, supported by inbound demand for comprehensive ZLD, VapoNova<sup>es</sup> (MVR), and StemNova<sup>st</sup> (MEE) solutions. Customers increasingly view Thermax not just as a technology provider but as a strategic enabler of compliance, sustainability, and operational resilience.

By combining portfolio depth, segment diversity, digital engagement, and strategic partnerships, Thermax demonstrates a scalable growth model and brand strength essential for sustained customer acquisition and leadership in the APAC ZLD market.

## Conclusion

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Thermax stands out as a leader in Asia Pacific's (APAC) zero liquid discharge (ZLD) industry by converting the segment's biggest pain points (energy intensity, uptime risk, and deployment complexity) into durable customer advantages through defensible engineering and disciplined execution. Its thermal leadership, including an all-electric, modular mechanical vapor reactor that commissions in days, resets price/performance while metallurgy and design choices extend run time and predictability. The company's value is further enhanced in operations via Edge Live's fleet-wide remote monitoring, dosing optimization, and predictive maintenance. Moreover, this customer-first experience begins at purchase with a guided configurator and rapid, transparent proposals that keep cost, scope, and timelines under control, then continues through responsive retrofit capability. The company has deliberately shifted its focus to wastewater treatment and ZLD and has expanded its high and ultra-pure water filtration capabilities through strategic acquisition with TSA Process Equipments (high purity) and through partnership with NX Filtration. These moves drive diversified wins across metals, food and beverage, pharmaceuticals, chemicals, and automotive sectors. As a result, the company does not just comply with ZLD mandates, but it makes them economically viable, operationally reliable, and strategically accretive for customers.

With its strong overall performance, Thermax earns Frost & Sullivan's 2026 Asia Pacific Customer Value Leadership Recognition in the ZLD industry.

## What You Need to Know about the Customer Value Leadership Recognition

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Frost & Sullivan's Customer Value Leadership Recognition is its top honor and recognizes the market participant that exemplifies visionary innovation, market-leading performance, and unmatched customer care.

### Best Practices Recognition Analysis

For the Customer Value Leadership Recognition, Frost & Sullivan analysts independently evaluated the criteria listed below.

#### Business Impact

**Financial Performance:** Strong overall business performance is achieved in terms of revenue, revenue growth, operating margin, and other key financial metrics

**Customer Acquisition:** Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

**Operational Efficiency:** Company staff performs assigned tasks productively, quickly, and to a high-quality standard

**Growth Potential:** Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

**Human Capital:** Leveraging innovative technology characterizes the company culture, which enhances employee morale and retention

#### Customer Impact

**Price/Performance Value:** Products or services offer the best ROI and superior value compared to similar market offerings

**Customer Purchase Experience:** Purchase experience with minimal friction and high transparency assures customers that they are buying the optimal solution to address both their needs and constraints

**Customer Ownership Excellence:** Products and solutions evolve continuously in sync with the customers' own growth journeys, engendering pride of ownership and enhanced customer experience

**Customer Service Experience:** Customer service is readily accessible and stress-free, and delivered with high quality, high availability, and fast response time

**Brand Equity:** Customers perceive the brand positively and exhibit high brand loyalty, which is regularly measured and confirmed through a high Net Promoter Score®

## Best Practices Recognition Analytics Methodology

### Inspire the World to Support True Leaders

This long-term process spans 12 months, beginning with the prioritization of the sector. It involves a rigorous approach that includes comprehensive scanning and analytics to identify key best practice trends. A dedicated team of analysts, advisors, coaches, and experts collaborates closely, ensuring thorough review and input. The goal is to maximize the company’s long-term value by leveraging unique perspectives to support each Best Practice Recognition and identify meaningful transformation and impact.

STEP		VALUE IMPACT	
		WHAT	WHY
1	<b>Opportunity Universe</b>	Identify Sectors with the Greatest Impact on the Global Economy	Value to Economic Development
2	<b>Transformational Model</b>	Analyze Strategic Imperatives That Drive Transformation	Understand and Create a Winning Strategy
3	<b>Ecosystem</b>	Map Critical Value Chains	Comprehensive Community that Shapes the Sector
4	<b>Growth Generator</b>	Data Foundation That Provides Decision Support System	Spark Opportunities and Accelerate Decision-making
5	<b>Growth Opportunities</b>	Identify Opportunities Generated by Companies	Drive the Transformation of the Industry
6	<b>Frost Radar</b>	Benchmark Companies on Future Growth Potential	Identify Most Powerful Companies to Action
7	<b>Best Practices</b>	Identify Companies Achieving Best Practices in All Critical Perspectives	Inspire the World
8	<b>Companies to Action</b>	Tell Your Story to the World (BICEP*)	Ecosystem Community Supporting Future Success

\*Board of Directors, Investors, Customers, Employees, Partners

