

THE POWER TO LEAD

**ACERT™ TECHNOLOGY
FOR MARINE ENGINES**



CATERPILLAR® MARINE POWER SYSTEMS

“ACERT™ Technology is a breakthrough because it is a combination of individual technologies married together that is very different from what anyone else has to offer. It’s a breakthrough we worked on for a long time and we didn’t see the answer until we began to look for different combinations.”

**Director of Engine Design and Development
Caterpillar Inc.**

THAT’S THE POWER TO LEAD.



LEVERAGING ACERT TECHNOLOGY FOR MARINE.

ACERT Technology is the product of a \$500 million investment structured on the broadest product, application and manufacturing base in the industry. No other marine engine supplier can draw on an 11 kW to 16000 kW product experience, combined with internal fuel systems, manufacturing and internal electronic controls design. This broad, solid base is what makes it possible for the building blocks of ACERT Technology to work better together than they would as stand-alone components.

The investment paid off when Caterpillar made landmark breakthroughs in the science of fuel combustion. ACERT Technology allows the combustion process to be shaped and managed with an extremely high degree of precision. The end result is an engine that meets emissions requirements both now and in the future.

Advanced combustion has been a goal of engine researchers for decades. But only Caterpillar has the expertise, resources and technology base—with proprietary electronic controls, fuel systems and air management systems—to make it a reality.

PROVIDES BETTER PERFORMANCE.

What makes ACERT Technology good for the environment also makes it good for performance. Efficient combustion reduces engine wear and maximizes the amount of fuel energy applied to the propeller or generator. ACERT Technology drives the combustion system to pull the maximum amount of energy from each injection.



DEVELOPING ACERT TECHNOLOGY

WHAT MAKES ACERT TECHNOLOGY SO SIMPLE?

ACERT Technology is primarily a combustion technology; therefore there is no external plumbing to clutter cramped engine rooms. ACERT Technology also avoids the complications and costs of water injection systems and urea-based catalysts.

In addition, when you specify an engine, ACERT Technology building block components are included only as needed, so you get a solution customized and optimized for your application.

WHAT MAKES ACERT TECHNOLOGY SO ADVANCED?

Any company can purchase off-the-shelf technology and call it innovation. Only Caterpillar has the breadth of product line, application experience, manufacturing capabilities and design expertise to create a comprehensive, long-term emissions and performance solution. The building blocks of ACERT Technology are optimized to work together in a highly integrated way.

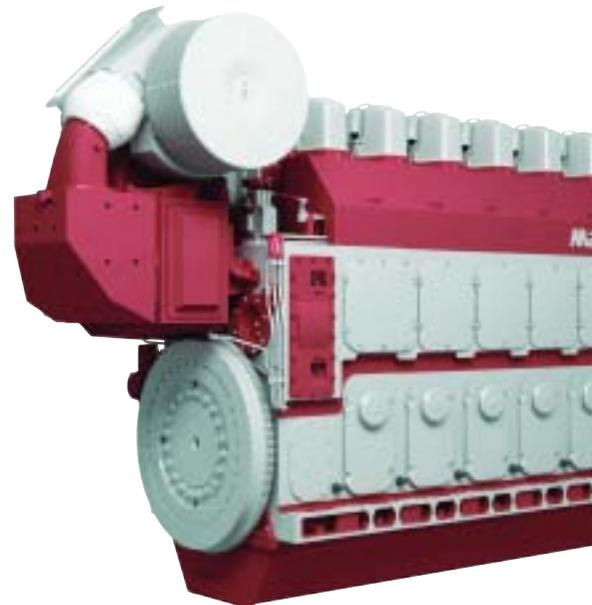
ACERT Technology is already proving itself in demanding applications. Thousands of Cat® engines with ACERT Technology are now logging miles in on-highway trucks or cruising the world's oceans—and customer reaction has been outstanding.

A CLEAR FUTURE.

As worldwide emissions standards tighten, Caterpillar will continue to rise to the challenge. Unlike other emissions solutions, ACERT Technology offers a clear direction for future regulatory compliance.

The building blocks of ACERT Technology can be added as needed, and they're being constantly refined to enhance their effectiveness.

ACERT Technology is the right solution for marine power today. And you can count on it to meet the challenges of tomorrow.



BUILDING BLOCKS OF ACERT TECHNOLOGY

The building blocks that make up ACERT Technology fall into four categories:



FUEL DELIVERY

Multiple injection fuel delivery introduces fuel into the combustion chamber in a series of precisely-timed "microbursts."

This allows control over many more variables during the combustion process. The combustion cycle can be tailored to deliver maximum power and efficiency with minimum emissions for a wide range of engine speeds and loads.



ELECTRONICS

The Cat ADEM™ electronic controller acts as the brains of ACERT Technology. Pioneered by Caterpillar almost 20 years ago, the ADEM controller coordinates and enhances fuel delivery, air supply and other engine functions to maximize overall performance and reduce emissions output.



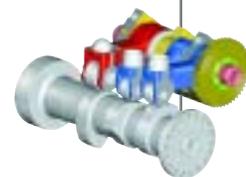
AIR MANAGEMENT

Cat engines with ACERT Technology use a variety of refined air management technologies, including crossflow cylinder heads and wastegate turbochargers. They also take advantage of several new innovations:

Variable Valve Timing uses electronically-controlled hydraulic actuators to govern when valves open and close to let air in and exhaust out of the combustion chamber.

Series Turbocharging uses two smaller turbos together to reduce lag time while maintaining high airflows. Lower shaft speeds also enhance reliability and service life.

MaK Flex Cam Technology offers another way to precisely control valve timing. This technology allows MaK engines to exceed current IMO emissions requirements using an easy-to-maintain internal solution.



COMBUSTION DESIGN

To optimize the flexibility of these new systems, Caterpillar utilizes advanced predictive modeling software that incorporates factors such as aerodynamics, thermodynamics, spray penetration, fuel vaporization, ignition, combustion and emission chemistry to select the best nozzle configurations and combustion cylinder geometry.

LEADING THE WAY.

For more than 80 years, Caterpillar and MaK have been global leaders in marine engine manufacturing. A sales leader in every market we serve, Caterpillar is dedicated to putting excellence on board any vessel, anywhere in the world.

From propulsion engines to drive line and electronic control systems, from auxiliary power units to generator sets, Caterpillar Marine Power Systems offers a complete line of dependable, reliable systems for the power you live by.

WORLDWIDE CAT® DEALER NETWORK.

Caterpillar gives you access to more than 2,000 service locations worldwide—the best dealer coverage in the industry. Most parts are available within 24 hours, anywhere in the world.

Your local dealer offers complete sales and service support for all Cat products, with flexible financing for any engine or an entire vessel. With representatives in every time zone, you'll have a service home in every port.

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