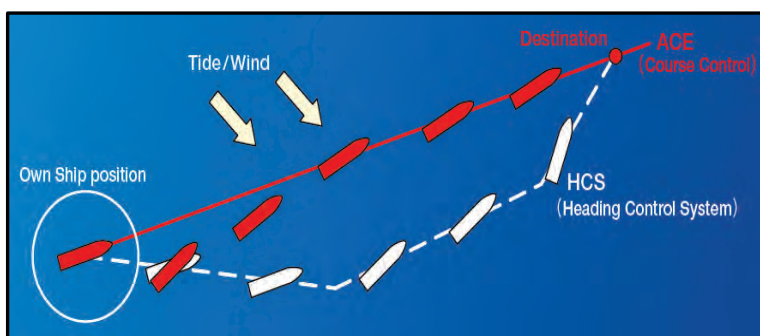


A.C.E. - Advanced Control for Economy Route Track-Control for PR-9000 Autopilots

Tokyo Keiki's new ACE Course Control function automatically implements the best rudder commands to provide fuel cost savings.

Estimated Annual Fuel Savings USD\$20,000 - \$100,000+

- ACE saves fuel by optimizing steering to maintain the straightest course possible. Savings* depends on the ship's size, shape, sea conditions, etc. Typical savings range between 1-1.5% of fuel costs.
- ACE works by mitigating drift caused by wind and currents.
- ACE brings modern Autopilot technology to legacy PR-9000 Autopilots at an affordable price.
- Owners often recoup the initial ACE expense within months.
- ACE is ideal for larger vessels that are more prone to the influence of wind and current.
- High quality product from Tokyo Keiki; installed by Mackay Marine.



ACE Course Control function creates the shortest path along the course steered; this promotes fuel savings while mitigating cross track error (XTD).

ACE Characteristics

- Operates the same as normal Heading Control. Changeover between ACE function and Heading Control is done by a single push of a button.
- Route deviation is reduced, allowing the vessel to sail the shortest distance to the destination without influence from tides and wind.
- Reduction in course changes decrease the amount of Rudder used, thus lessens the burden on the Helmsman.
- Installation is simple, typically performed in a single day

ACE Est. Savings Analysis with Current Fuel Market

VLCC Tanker: Fuel Oil Consumption = 104 MT/DAY

- o $104 \text{ MT/DAY} \times 0.01 (1.0\%) = 1.04 \text{ MT/DAY}$
- o $1.04 \text{ MT/DAY} \times \text{USD } \$400/\text{MT} = \text{USD } \$416/\text{Day} \times 200 \text{ OP days}$

Potential ANNUAL SAVINGS*

\$83,000 / Year USD

Container: Fuel Oil Consumption = 150 MT/DAY

- o $150 \text{ MT/DAY} \times 0.015 (1.5\%) = 2.25 \text{ MT / DAY}$
- o $2.25 \text{ MT/DAY} \times \text{USD } \$400/\text{MT} = \text{USD } \$900/\text{DAY} \times 200 \text{ OP days}$

\$180,000 / Year USD

Handysize Bulker: Fuel Oil Consumption = 20 MT/DAY

- o $20 \text{ MT/DAY} \times 0.0147 (1.47\%) = 0.294 \text{ MT / DAY}$
- o $0.294 \text{ MT/DAY} \times \text{USD } \$400/\text{MT} = \text{USD } \$118/\text{DAY} \times 200 \text{ OP days}$

\$23,000 / Year USD

2016 Press Release – TOKYO-Mitsui O.S.K. Lines, Ltd. (MOL) Announced that the company, along with Tokyo Keiki Inc., conducted a performance demonstration test of its autopilot route control function A.C.E., onboard a vessel in service. The results show an energy savings of about 1.5%.

Full Press Release: <https://www.mol.co.jp/en/pr/2016/16017.html>



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A4 12/25.1



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NOTE: 'Physical Street Address' of Mackay's global locations are listed at:
<https://www.mackaycomm.com/about-mackay/sales-service-locations/>