

BMS-2000Ⅲ, BMS-2000Ⅳ **(Engine Remote Control System)**

Rough Sea Auto Speed Reduction **Auto Engine Load Control** **for ME-B, ME-C**

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Summary

Fuel-Saving functions

Rough Sea Auto Speed Reduction (ASR)

- 0.83% fuel savings by reducing engine speed due to sea conditions
- in rough sea

Auto Engine Load Control (ALC)

- 1.23% fuel savings by continuously controlling Order Speed to keep Engine Load constant
- in rough sea
- in non-rough sea
- in increased load condition

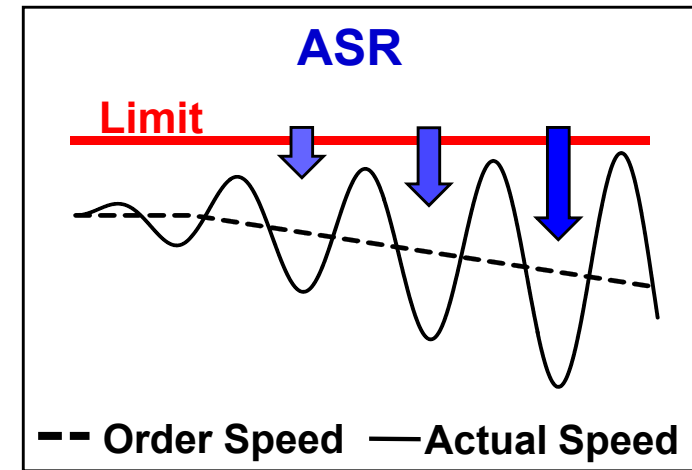
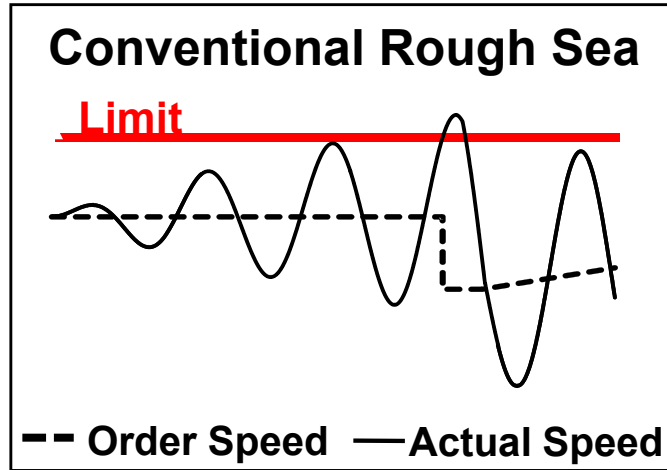
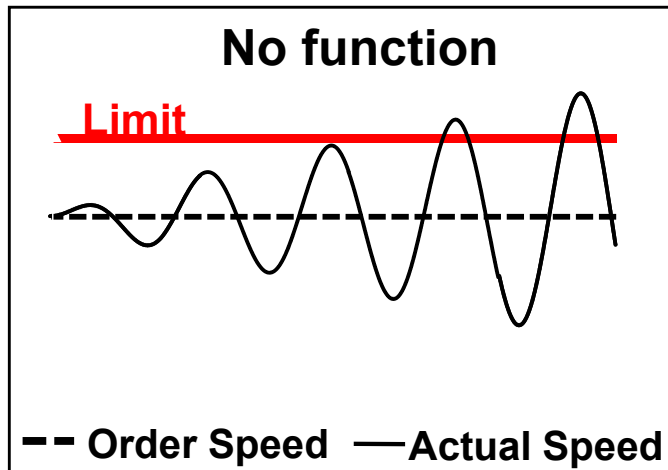
Using ASR and ALC simultaneously

- 2.06% Fuel Savings

Effects are simulation data and are not guaranteed.

Rough Sea Auto Speed Reduction (ASR)

Automatically reduce order speed due to sea conditions



Drop to preset speed when engine speed reach limit

Reduce order speed further due to sea conditions
Reduce more when M/E speed reach limit

- **Save Fuel** in Rough Sea (**Initiative to CII**)
- Prevent Over Load
- Prevent Over Speed Shut Down
- Effective during **slow steaming**

Effects are simulation data and are not guaranteed.

Rough Sea Auto Speed Reduction(ASR)

Availability

Control Position	ME-B	ME-C
W/H	Available	Available
C/R	Available	Unavailable

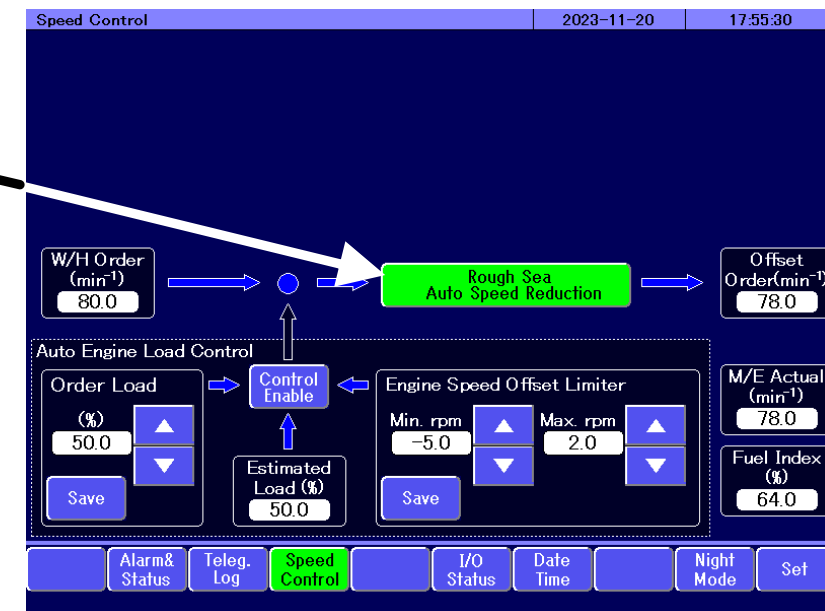
see p.16

Indicator for ASR

- When ASR is activated, indicator in W/H display and C/R display turns on
- W/H display**

Conditions for ASR

- ASR button in W/H display or C/R Display is ON (ON when power is on)
- Order speed is ahead FULL or more
- No Emergency Shut Down or Slow Down
- Not in a canceled state (see p.5)



Rough Sea Auto Speed Reduction (ASR)

ASR switch (ON when power is on)

Location	ME-B	ME-C
W/H	W/H display	W/H display
C/R	C/R display	C/R display

available regardless of control position

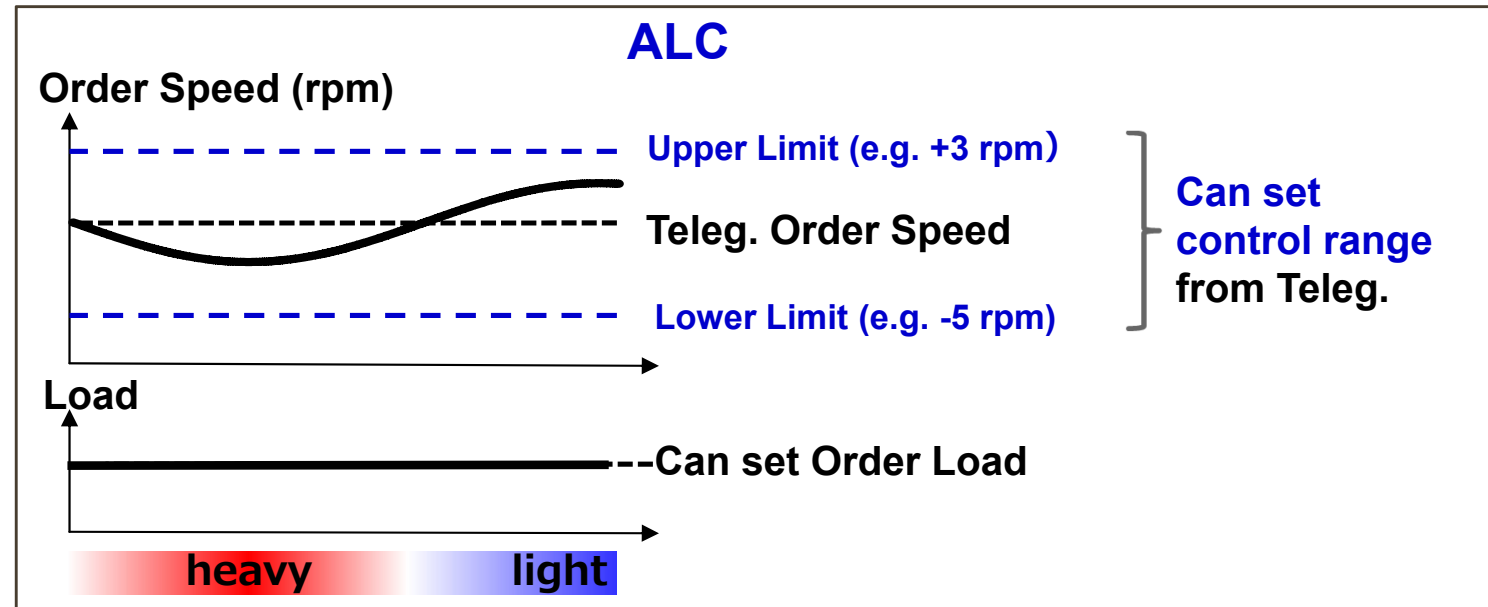
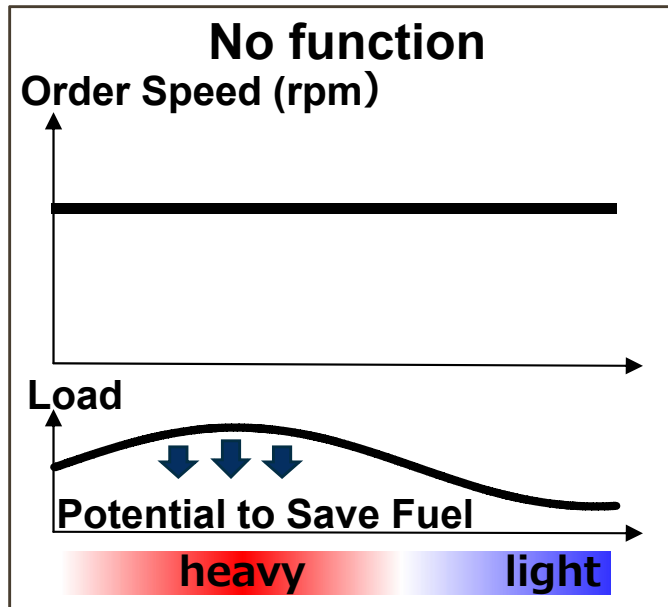
Temporary cancellation of ASR (ASR button is kept ON)

- Changing order speed (standard 20 minutes)
- Operation of the following switches

Location	ME-B	ME-C
W/H	Load Program Cancel	Increase Limit
C/R	Increase Limit	none

Auto Engine Load Control (ALC)

Control engine load constant, Optimize slow steaming



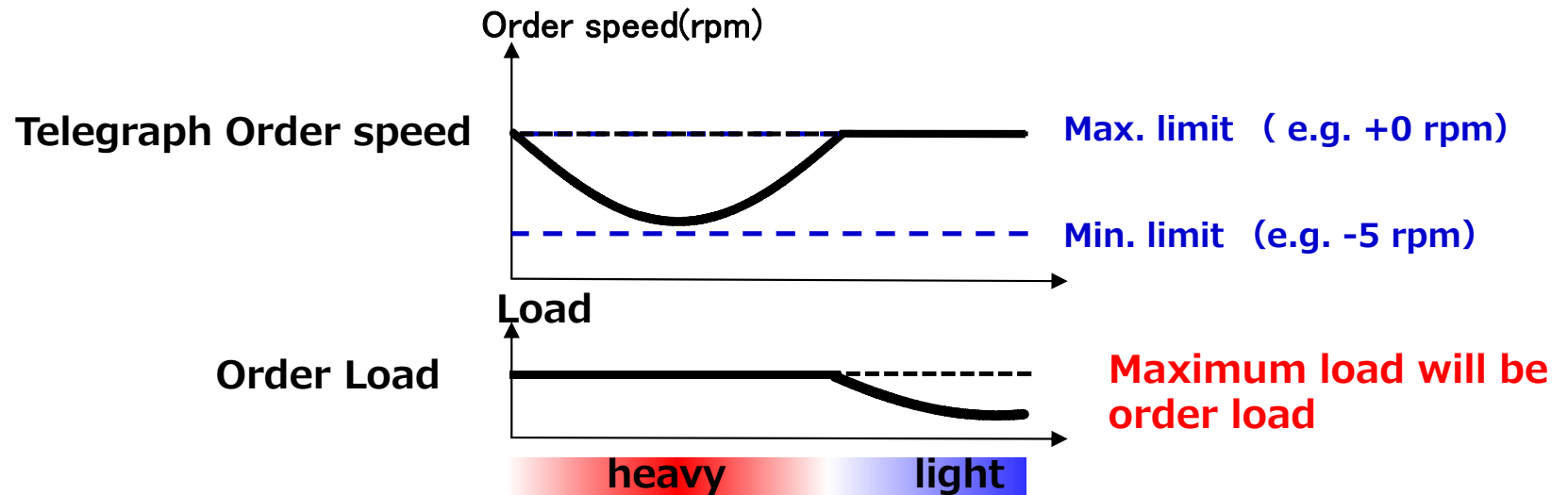
Control order speed to minimize engine load fluctuations

- **Save Fuel** in Increased Load Condition (**Initiative to CII**)
- Prevent Over Load
- Prevent Too Low Load to optimize slow steaming
- **Minimize Fuel Consumption Fluctuations**

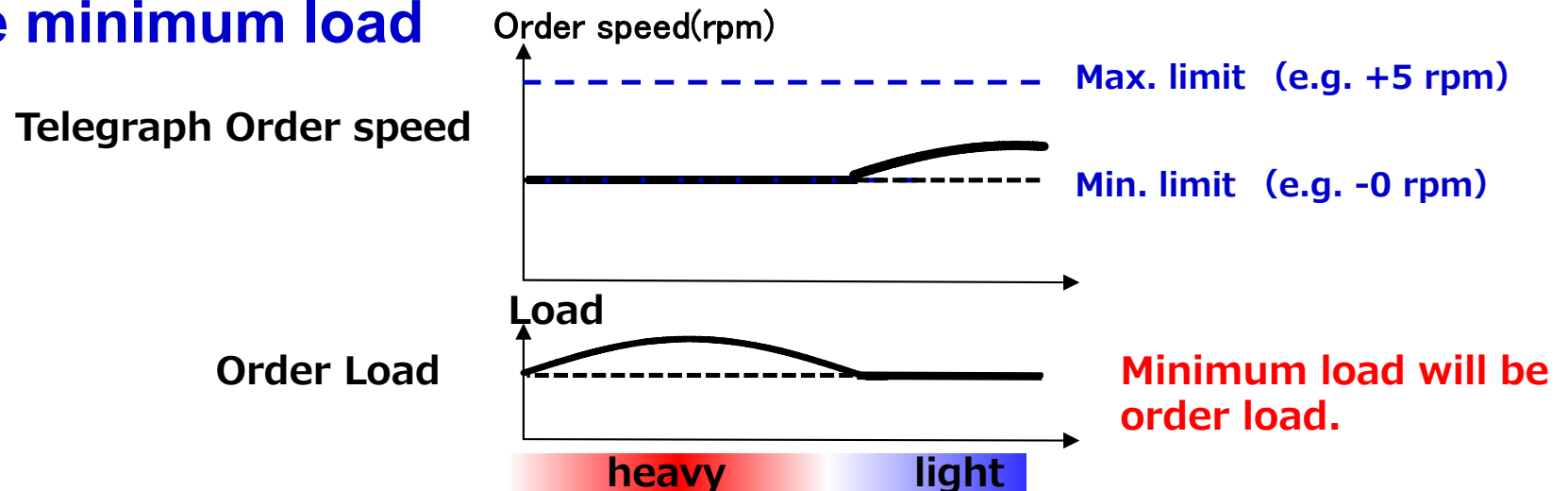
Effects are simulation data and are not guaranteed.

Auto Engine Load Control Offset Limiter Example

- Limiting the maximum rpm to Telegraph
- Allowing load to decrease



- Limiting the minimum load



Auto Engine Load Control (ALC)

Availability

Control Position	ME-B	ME-C
W/H	Available	Available
C/R	Available	Unavailable

see p.16

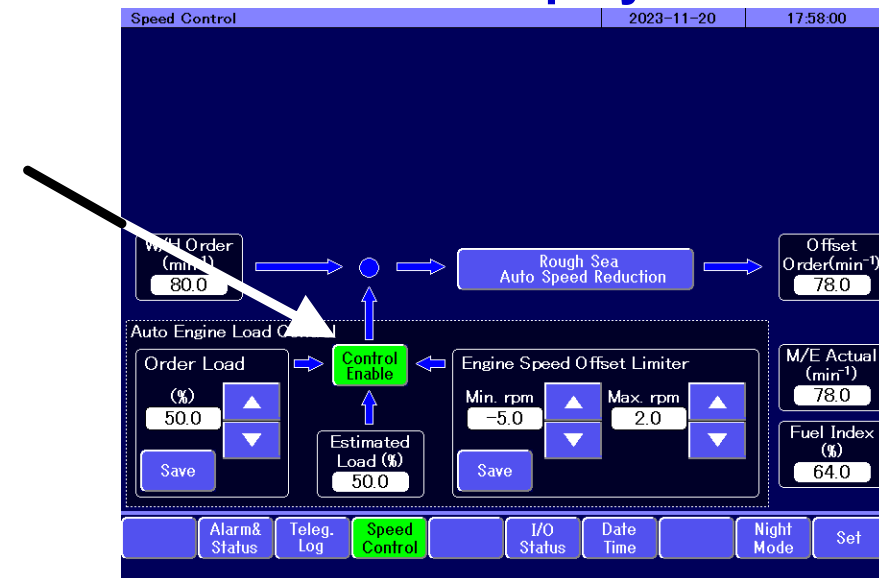
Indicator for ALC

- When ALC is enabled, indicator in W/H display and C/R display turns on

Conditions for ALC

- Control Enable button in W/H display or C/R Display is ON (OFF when power is on)
- Running ahead
- No Emergency Shut Down or Slow Down
- Not in a canceled state (see p.5)

W/H display



Auto Engine Load Control (ALC)

Control Enable button (OFF when power is on)

Location	ME-B	ME-C
W/H	W/H display	W/H display
C/R	C/R display	C/R display

Switch in W/H is effective under W/H control

Cancellation of ALC (Control Enable button will be OFF)

- Changing the order speed by W/H Telegraph or C/R speed control dial
- Operation of the following switches

Location	ME-B	ME-C
W/H	Load Program Cancel	Increase Limit
C/R	Increase Limit	none

Operation of ASR and ALC

W/H display (BMS-2000ⅢME)

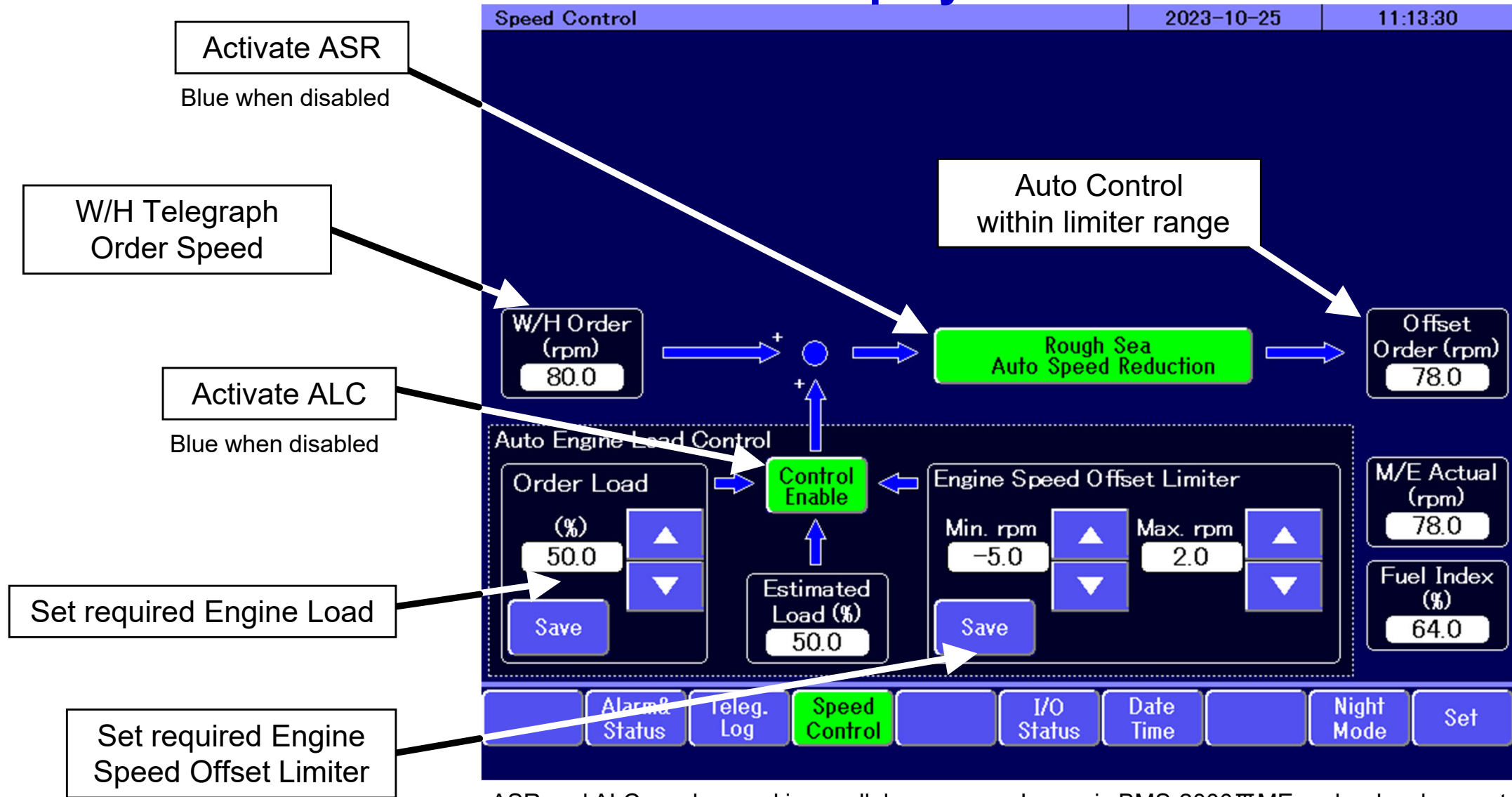
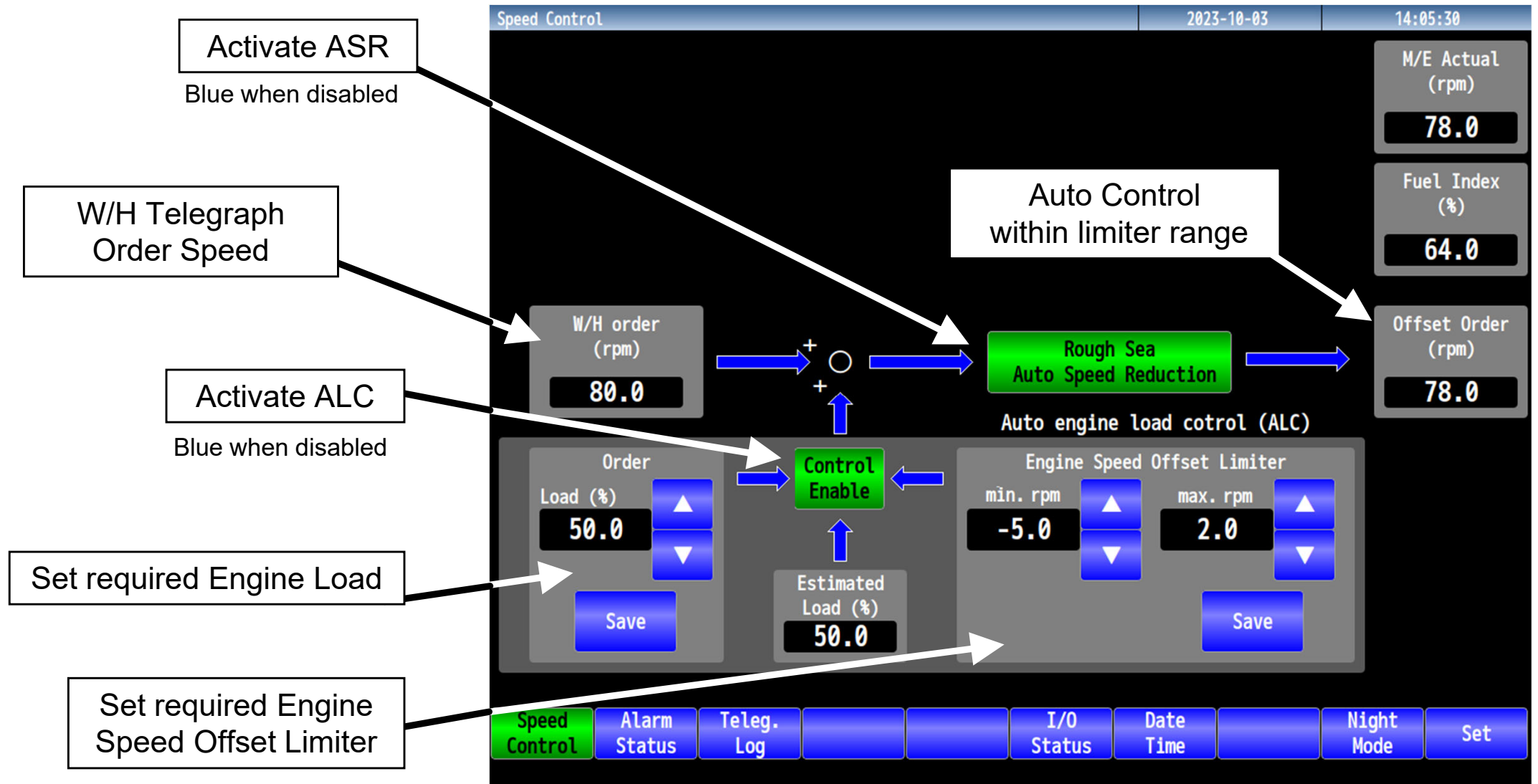


Image is BMS-2000ⅢME under development

Operation of ASR and ALC

W/H display (BMS-2000IV)



ASR and ALC can be used in parallel from W/H. Image is BMS-2000IV under development

Estimation of effectiveness for ASR and ALC with ME-C engine simulator

Effectiveness for ASR and ALC were estimated with ME-C engine simulator.

- Voyage data measured for actual 56BC (56,000 DWT Bulk carrier) were inputted to ME-C engine simulator.
(Voyage data: Actual main engine speed and actual fuel index)
- Fuel saving by ASR and ALC were estimated with ME-C engine simulator.

Effects are simulation data and are not guaranteed.



Effect on fuel consumption

Working frequency of ASR and ALC and Effect throughout the entire voyage

Applying to data measured from ship for 56BC NF division
820h. in 2012.

Fuel consumption simulation using ASR

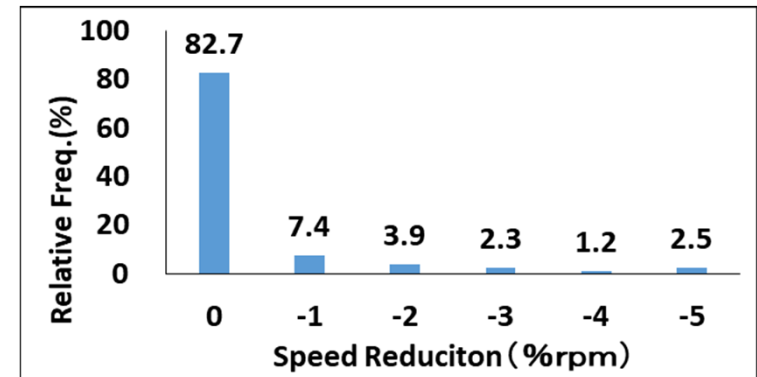
Simulate ASR setting to decrease 0–5% rpm.

Total rough weather time with ASR working is 17% (142h)

4 hours (0.52%) more operating time

0.83% fuel savings

ASR



Fuel consumption simulation using ALC

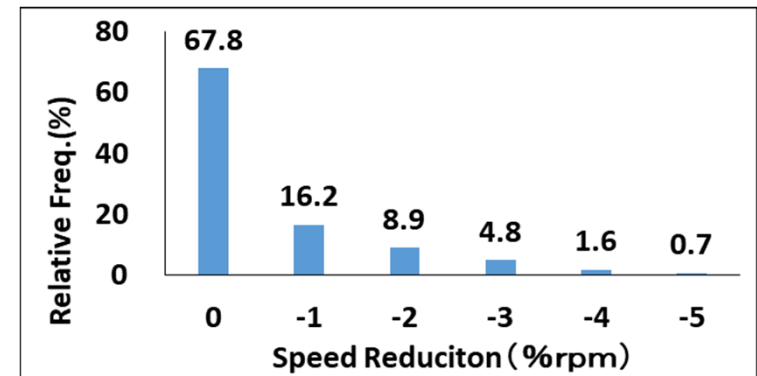
Simulate ALC setting to decrease 0–5% rpm by ALC
from 83% (678h) when ASR does not work.

Total time with ALC working is 32% (264h)

6 hours (0.75%) more operating time

1.23% fuel savings

ALC



Using ASR and ALC simultaneously

10 hours (1.27%) more operating time, 2.06% fuel savings

Effects are simulation data and are not guaranteed.

Effect on fuel consumption

Effect of slow steaming

Decrease by 1%rpm from 50% Load



Engine speed Ship speed (%) A	Operating hour $t = 94.7/A$	Load (%) B	M/E Fuel ratio (Assumption) C	Fuel consumption per hour $Q_t = B/85 \times C$	Fuel consumption per distance $Q_d = Q_t \times t$
94.7 (0%)	1.00 (0%)	85.0 (-16.2%)	1.000	1.00 (0%)	1.00 (38.7%)
84.3 (-11%)	1.12 (12.3%)	60.0 (-5.8%)	1.017	0.72 (-28.2%)	0.81 (-19.4%)
79.4 (-16.2%)	1.19 (19.3%)	50.0 (0%)	1.028	0.60 (-39.5%)	0.72 (-27.9%)
78.4 (-17.2%)	1.21 (20.8%)	48.2 (1.3%)	1.030	0.58 (-41.6%)	0.71 (-29.5%)
77.4 (-18.3%)	1.22 (22.4%)	46.4 (2.6%)	1.032	0.56 (-43.7%)	0.69 (-31.1%)
76.4 (-19.3%)	1.24 (24%)	44.6 (3.9%)	1.034	0.54 (-45.7%)	0.67 (-32.7%)
75.4 (-20.4%)	1.26 (25.6%)	42.9 (5.3%)	1.036	0.52 (-47.7%)	0.66 (-34.3%)
74.4 (-21.4%)	1.27 (27.3%)	41.2 (6.7%)	1.038	0.50 (-49.7%)	0.64 (-36%)

Effect of reducing speed by ASR and/or ALC

1%rpm slowdown reduces fuel consumption by 3.4% per hour and 2.2% per distance

Effects are simulation data and are not guaranteed.

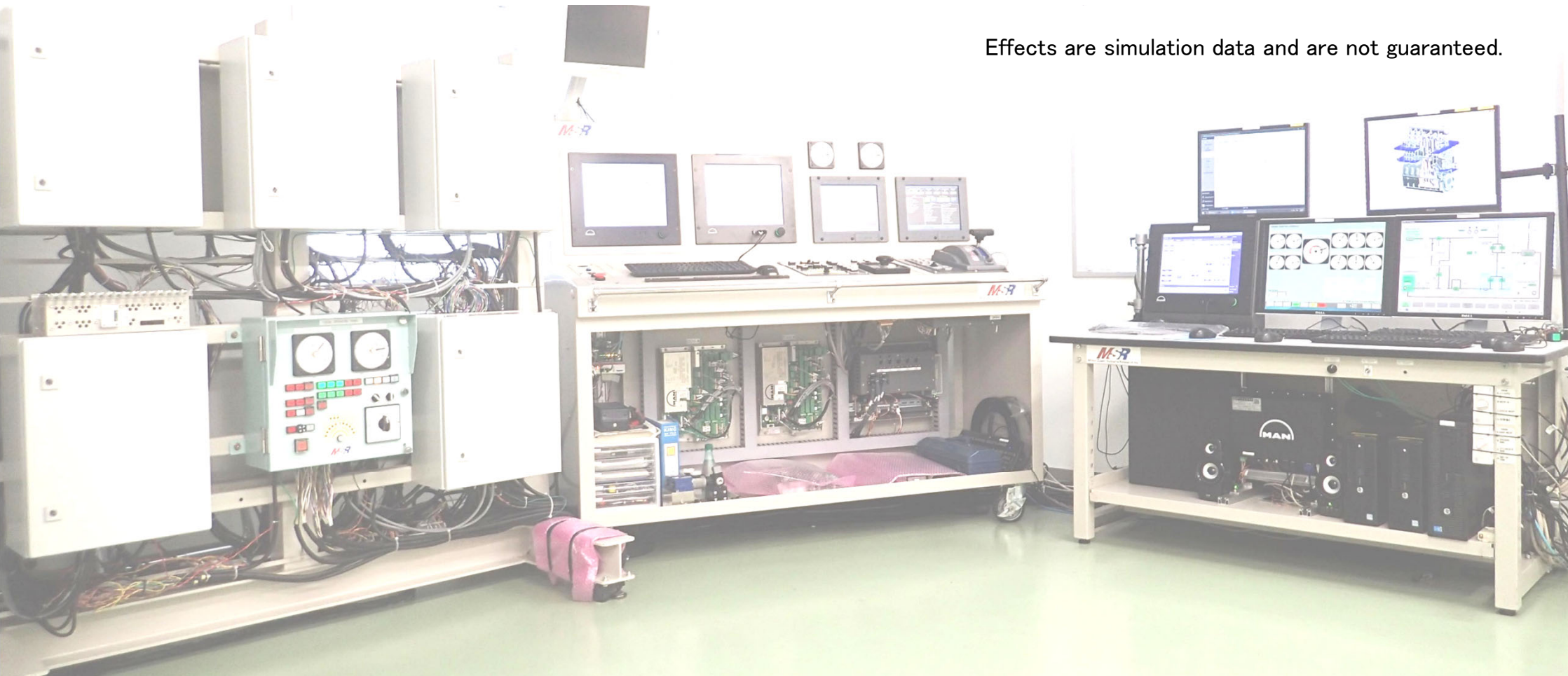
Effect on fuel consumption

Effect of stabilizing load by ALC

Simulate ALC without ASR by using data measured on a ship for ME-C engine simulator.

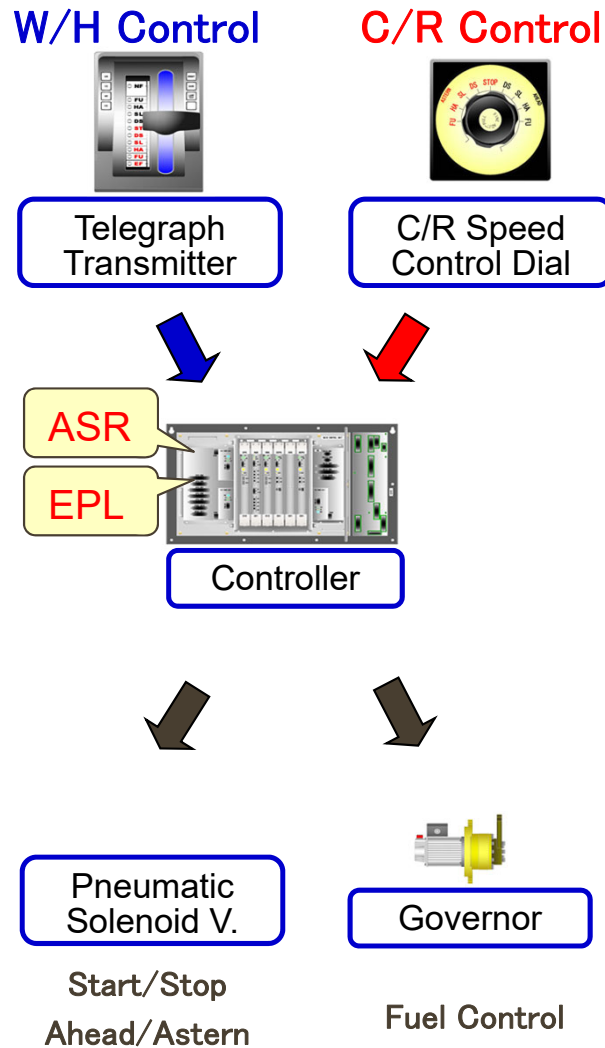
0.33% fuel savings under the same average speed conditions by changing the control parameters according to the sea conditions in order to reduce load fluctuations.

Effects are simulation data and are not guaranteed.

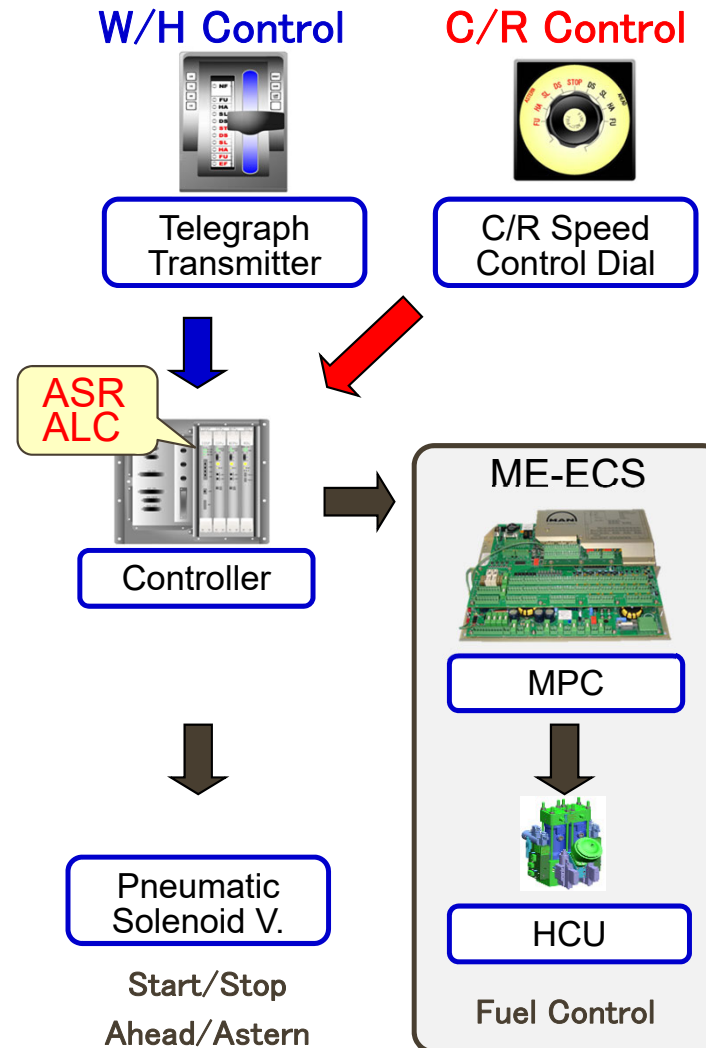


ME-C: Why ASR, ALC not available in C/R?

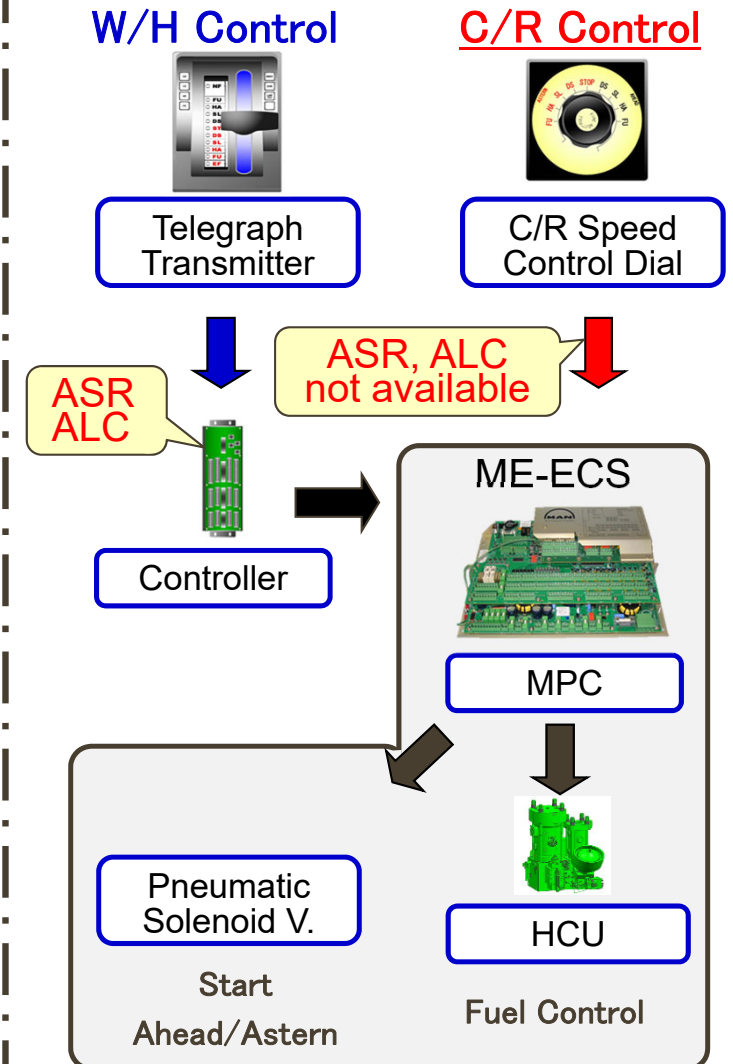
MC



ME-B



ME-C



C/R Speed Control Dial is **directly** connected to ME-ECS.