About the decrease rate of the fuel consumption of a ship engine

A.   A proposal about the use method of "Trans-master" appliance.

    (a)   At first, it is necessary that a big decrease effect of the fuel
consumption with "Trans- master" appliance is confirmed about the heavy
fuel oil "A" that   is used for an auxiliary engine.

    (b) That reason
As for the decrease rate of the fuel consumption with "Trans-master"
appliance the expressing by the practical numerical value that have
meaningful accuracy about the heavy fuel oil "A" used for main engine,
is most necessary.

  (1) The problems about difficult measurements in navigation test of a ship,

    (a) The sea conditions that the fuel consumption are decided with state of
"ON" or with state of "OFF" by "Trans-master" appliance, are greatly
different each in navigation tests.

    (b) The fuel consumption by a main engine is changed greatly by the changes
of the sea conditions such as a tide and waves and a wind.

    (c) The decrease of only 1% of the fuel consumption is the biggest economical
problem in the marine transportation industry.

    (d) The fact that the use method of "Trans- master" appliance mentioned above
is the most certain and is safe, is showed.

  (2) Therefore, the decrease rate of the fuel consumption can be confirmed enough
with effective accuracy because a influence of the sea condition exists little
about an auxiliary engine though a influence of the sea condition cannot be
kept off with a main engine in navigation test of a ship.

B. The method for getting the utility decrease rate of the fuel consumption of a ship by
fuel oil with "Trans- master" appliance.

(a) Generally, as for the navigation condition of a ship, the navigation with the full load being used up almost with the rated output of a ship engine to use heavy fuel oil "A" most effectively economically is very natural.

(b) The new motive power energy by the expansion pressure of explosive vaporization by magnetism that is generated to an engine in navigation of a ship by "Trans-master" appliance, is consumed for various kinds of load being generated in navigation of a ship.

(c) Therefore, when every various kinds of loads of a ship are generated in the states of navigation of a ship, the states of navigation of a ship that the new motive power energy is consumed, are classified and described as follows.

(1) When the number of revolution of the output shaft of a ship engine that was set beforehand cannot be maintained and is decreased by over loading of a ship.

(a) In this case, at first the number of revolution of the output shaft that was decreased is raised to the number of revolution that was set beforehand by motive power energy.

(a-1) As a result, the ship speed rises.

(a-2) By a rise in ship speed, the decrease quantity of heavy fuel oil "A" by shortening navigation time of a ship is returned to the auxiliary tank virtually.

(b) Further, when motive power energy remains a little quantity of heavy fuel oil "A" is decreased automatically because the number of revolution of the output shaft of a ship engine is decreased by the control system by the electron governor.

(b-1) In other words, the quantity of heavy fuel oil "A" blown into the inside of a cylinder is adjusted by control system of an engine of a ship automatically to always keep the number of revolution of the output

shaft of a ship engine that was set beforehand when number of
revolution of an engine changes.

   (b-2) As a result, in this case the decrease quantity of heavy fuel oil
     "A" is expressed with oil gauge of a main engine.

(c) Furthermore, when motive power energy remains the number of revolution of
the output shaft of an engine rises automatically more than number of
revolution of the output shaft that was set beforehand by control system of
a ship engine.

   (c-1) As a result, the ship speed rises.

   (c-2) By a rise in ship speed, the decrease quantity of heavy fuel oil
     "A" by shortening navigation time of a ship is returned to the
     auxiliary tank virtually.

(2) When the number of revolution of the output shaft of a ship engine that was
set beforehand is maintained with the lower load than the rated load to a ship.

   (2-a) The results same as clause (c) of section (1) mentioned above are
     obtained.

(3) Because the influence for the decrease test of the fuel consumption is too big
in the strong ocean current conditions such as tide and waves and wind, the
navigation test of a ship cannot be carried out.

(4) The contents of the decrease rate of the fuel consumption of a ship by the
heavy fuel oil "A" with "Trans-master" appliance are expressed by each
navigation conditions that were described in each section (1) and section
(2) mentioned above.

(5) According to the navigation test in constant condition we can always get the
utility decrease rate of the fuel consumption.

(6) Because the ship is navigated in full load generally, it is considered that

the navigation test becomes the navigation tests that various kinds of load
conditions were mixed like section (1)

(7) However, in this case the results in the navigation tests in various kinds
of load conditions are expressed as the decrease rate of the fuel consumption
that added each all the decrease rates of the fuel consumption up
automatically.

C. Test of a ship engine by "Trans-master" appliance,

(a) It is the test result of the decrease rate of the fuel consumption of a ship
engine by the experiment ship of 2,700HP as follows.

(b) Condition of fuel oil

(b-1) Fuel consumption of an engine ： 200 liters/h.

(b-2) Capacity of an auxiliary tank ： 1,000 liters.

(b-3) Heavy fuel oil "A" is for exclusive use,

(c) Conditions for the use of "Trans-master" appliance,

(c-1) Temperature of fuel oil ： 80 degrees Celsius maximum.

(c-2) Working pressure ： 4Kg/㎠ maximum.

(d) The "Trans-master" appliance that is put on the cover of an auxiliary tank
and adds a big kinetic-energy by magnetism to the molecule of fuel oil that
was put into an auxiliary tank from a main tank of the experiment ship.

(C-1) The decrease test of the fuel consumption by "Trans-master" appliance by
navigation test data in the experiment ship ： 2005 / 11 / 05 ～ 12 / 30

NO.1

第 三 住若丸　7th

自 ： 橘　　　　　至 ： 釜石　　（満船）/空船　　　平均回転数　260 rpm

H.17	時刻	○活性化 ×通常	消費量 L	時間消費量 L/h	航走距離 浬	排気温度 #1	#2	#3	#4	#5	#6	ラック m/m	概　位　等	風 m/s	備　考
11/5	20:00	×	606	202.0	33.2	320	325	320	330	325	320	30	14:00 活性化装置 OFF	0	
	23:00	×												0	
	23:00	×	595	198.3	35.6	320	325	320	330	325	320	30		0	23:00 North 5m
11/6	2:00	×											02:45 塩屋崎通過	0	
	2:00	×	605	201.7	33.6	320	325	320	330	325	320	30		0	02:00 North 4m
	5:00	×												0	
	5:00	×	600	200.0	34.8	315	320	315	325	315	315	30		0	05:00 North 5m
	8:00	×												0	
	8:00	×	600	200.0	36.5	310	315	310	320	310	310	30	10:00 金華山通過	0	
	11:00	×												0	
	11:00	×	590	196.7	33.2	310	315	310	320	310	310	30		0	11:00 NE 4m
	14:00	×												0	
	14:00	×	328	200.9	20.0	310	315	310	320	310	310	30		0	14:00 SE 4m
	15:38	×											15:38 釜石入港	0	
	合計/平均		3,924	199.9	226.9										

消費量/浬　　17.29 L/浬
航走距離/L　107.09 m/L
平均速力　　11.56 Km
過給機圧力 0.6～0.62

NO.2

第 三 住若丸　8th　トランスマスター 計 3 ヶ(7thまでは 2 ヶ)
（H17/12/0 トランスマスター 1ヶ増設　横港)

自 ： 粟津　　　　至 ： 東広島　　（満船）/空船　　　平均回転数　260 rpm

H.17	時刻	○活性化 ×通常	消費量 L	時間消費量 L/h	航走距離 浬	排気温度 #1	#2	#3	#4	#5	#6	ラック m/m	概　位　等	風 m/s	備　考
12/28	17:00	○	382	191.0	25.7	300	300	295	305	300	300	29	16:00 鳴門海峡通過 (順流)	0	鳴門海峡 12/28
	19:00	○				295	295	295	305	300	300	29			最強 16:00 5.6Kn
	19:00	○	384	192.0	24.0									0	転流 18:19
	21:00	○				300	305	295	310	305	300	29			
	21:00	○	374	187.0	25.2								三原瀬戸	0	三原瀬戸
	23:00	○				300	305	295	310	305	305	29			最強 19:30 1.4Kn ENE
	23:00	○	190	190.0	12.5									0	転流 22:03
12/29	0:00	○				300	305	300	310	305	305	29		0	
														0	
														0	
														0	
														0	
														0	
	合計/平均		1,330	190.0	87.4										

消費量/浬　　15.22 L/浬
航走距離/L　121.70 m/L
平均速力　　12.49 Km
過給機圧力　　0.6

※ 補機 F.O.消費量
15 L/h　メーター計測
16 L/h　タンク計測

第三 住若丸　9th

自：下松　　至：坂出　　（満船）/空船　　平均回転数　260 rpm

H.17	時刻	○活性化 ×通常	消費量 L	時間消費量 L/h	航走距離 浬	#1	#2	#3	#4	#5	#6	ラック m/m	概位等	風 m/s	備考
12/30	2:00	○	384	192.0	22.7	305	310	300	315	305	305	28	01:20 下松出航	0	
	4:00	○				305	310	300	315	305	305	28			
	4:00	○	374	187.0	24.8									0	
	6:00	○				305	310	295	315	305	305	28			
	6:00	○	378	189.0	26.5									0	
	8:00	○				305	310	300	315	305	305	28	07:35 来島海峡通過 （順流）		来島海峡
	8:00	○	377	188.5	24.0									0	最強 07:47 7.6Kn 南流
	10:00	○				305	310	300	315	305	305	28		0	転流 11:11
	10:00	○	188	188.0	12.0									0	
	11:00	○												0	
													11:30 坂出入港	0	
														0	
														0	
合計/平均			1,701	189.0	110										

消費量/浬　15.46 L/浬
航走距離/L　119.76 m/L
平均速力　12.22 Kn
過給機圧力　0.6

(a) The decrease rate of the fuel consumption of 1% of numerical value in the marine transportation industry is very big numerical value that cannot be ignored economically.

(1) The test results mentioned above

(a) The decrease rate of the fuel consumption of a main engine is 5.2%.

(b) Fuel consumption per time by fuel level indicator of a main engine.

　(b-1) When "Trans-master" appliance is in state of "OFF"　：　An average of 199.9 liters/h.

　(b-2) When "Trans-master" appliance is in state of "ON"　：　An average of 189.5 liters/h.

(c) Navigation speed of a ship increases to 6.9 %.

　(c-1) When "Trans-master" appliance is in state of "OFF"：Average velocity

of a ship by data in the page of NO.1: 11.56km/h.

(c-2) When "Trans-master" appliance is in state of "ON" : Average velocity
of a ship by data in the pages of NO.2 and NO.3 : 11.56km/h.

(d) The exhaust gas temperature of the ship engine falls to an average of 14 ℃.

(d-1) Before the using "Trans-master" appliance ： An average temperature
is 318 ℃.

(d-2) After the using "Trans-master" appliance ： An average temperature is
304 ℃.

(e) By the big decrease in temperature of the exhaust-gas mentioned above, it
is considered clearly that the generation of oxides of nitrogen (NOx)
decreases greatly in combustion in the inside of a cylinder of a ship engine.

(f) By navigation tests of the experiment ship mentioned above, that results
were generated each in item (a), item (b), item (c), item (d).

(g) The facts that a big decrease effect of the fuel consumption by
"Trans-master" appliance is not thought in the common sense of the
conventional ship engine, were generated.

(C-2) Recent navigation test data of a ship by "Trans-master" appliance,

    (a) Test navigation course of a ship　:　from "Tobata Port" to "Tottori Port"
        in a condition of full load.

    (b) Wave height　:　1 meter or less.

  (1-1) The first navigation test.

    (a) Test data (1)

      (a-1) Departure from "Tobata Port" in a state of "ON" with "Trans-master"
        appliance : Running slowly in the inside of the gulf.

      (a-2)　2011 / 08 / 19 15：45 ~18：45：　"Trans-master" appliance in a state of
                             "ON"

NO.1

第3住若丸 トランスマスター燃費テスト

	日付	時間	主機流量計メーター(ℓ)	回転数	デジタル回転数	ラック1	ラック2	流 力	サービスタンク燃料流入補給	補機発電量	補機流量計メーター	その他
1	8月19日	7:20	3726									六連出航
2		8:00	(58) 3784						650		8979	戸畑接岸
3												荷役
4		15:45	3784								9098	戸畑出航 港内スピー
5		15:55	(16) 3800	262	271	28	25	11				回転上げる
6		16:45	(152) 3952	262	271	28	25	11	16:04 流入		(13) 9111	波浪 0.5
7		17:45	(188) 4140	262	271	28	25	10.7	○	35kW	(15) 9126	
8		18:45	(186) 4326	261	271	27	25	10.7	○ 800	35kW	(15) 9141	波浪 0.5

航　路　　戸畑~鳥取
空船　満船　　　満船
天　気　　くもり時々雨
波　浪　　0.5m

復一1

(1-2) Continual test of the first navigation test

  (a) Test data (2)

    (a-1) 2011 / 08 / 19 2 18：45 ~23：45："Trans-master" appliance in a state
of "OFF"

第3住若丸 トランスマスター燃査テスト

	日付	時間	主機流量計 メーター(ℓ)	回転数	デジタル 回転数	ラック1	ラック2	速 力	サービスタンク 移し入れ有無	補機 発電量	補機流量計 メーター	その他
1	8月19日	19:45	(188) 4514	292	271	26	25	10.8	950 ○	41kW	(14) 9155	波浪 1m
2	トランスマスターOFF	20:45	(187) 4701	262	271	26	25	11.2	760	35kW	(16) 9171	波浪 1m
3		21:45	(189) 4890	262	271	27	20	11	830 ○	48kW	(14) 9185	波浪 1m
4		22:45	(188) 5078	262	271	27	25	10.8	850 ○	35kW	(15) 9200	波浪 1m
5		23:45	(185) 5265	262	271	26	25	10.7	740	40kW	(15) 9215	波浪 1m
6												
7												
8												

航　路　　戸畑から鳥取

空船　満船　　　満船　　　　＊20:46 トランスマスター　OFF

天　気　　くもり

波　浪　　　1m

表－2

(1-3) Similarly, continual test of the first navigation test.

  (a) Test data (3)

    (a-1) Arrival at "Tottori Port",

    (a-2) 2011 / 08 / 20 6.00 ~ 11.32

第3佳若丸 トランスマスター燃費テスト

	日付	時間	主機流量計メーター(ℓ)	回転数	デジタル回転数	ラック1	ラック2	速力	サービスタンク燃料注入有無	補機発電量	補機流量計メーター	その他
1	8月20日	6:00	8431	262	271	27	25	10.5	780	30kW	9306	波浪 1m
2		7:00	(188)6619	262	271	27	25	11	910	30kW	(13)9319	波浪 1m
3		8:00	(185)6804	262	271	27	25	11	730	30kW	(13)9332	波浪 1m
4		9:00	(186)6990	262	271	27	25	11	830	32kW	(14)9345	波浪 1m
5		10:00	(186)7176	262	271	26	25	11.2	880	39kW	(15)9361	波浪 0.5m
6		11:00	(185)7361	262	271	27	25	11.3	770	35kW	(15)9373	波浪 0.5m
7		11:32	7466									鳥取港スロー開始
8		11:50	7476									着岸

航　路　戸畑から鳥取
空船　満船　満船
天　気　くもり
波　浪　1mから0.5m

＊20:46から トランスマスター OFF状態
＊戸畑、鳥取間 20時間05分 消費燃料 3692リットル

板-3

(1-4) A result of the first navigation test : From each item (1-a), item (1-b), item (1-c).

  (a) Duration from "Tobata Port" to "Tottori Port" : 20 hours 05 minutes.

  (b) Fuel consumption of a main engine : 3,692 liters.

(2-1) The second navigation test

(a) Test data (4)

(a-1) From "Tobata Port" to "Tottori Port", in a state of "OFF" of
"Trans-master" appliance,

(a-2) 2011 /08 / 30 ~ 08 / 31 16：00 ~ 12：50

NO.4

第三住若丸 トランスマスター概要テスト

平成23年 8 月 30 日～ 8 月 31 日

	日付	時間	主機売電計メーター(ℓ)	回転数	デジタル回転数	ラック1	ラック2	速力	波高		測定ポイント	その他
1	8/30	16-00	4932650								戸畑港出航前	
2	8/30	17-00	4932785	≥65	≥71	≥7	27	10.4	0.5m		六連島沖 ブイ通過時	
3	8/30	22-00	4933735	≥65	≥71	≥7	27	10.4	0.5m		5時間後	
4	8/31	03-00	4934685	≥65	≥71	≥7	27	11.1	1.0m		10時間後	
5	8/31	08-00	4935620	265	≥71	≥7	27	11.4	1.0m		15時間後	
6	8/31	12-00	4936375	≥65	≥71	≥7	27	11.5	1.0m		鳥取港入港前	
7	8/31	12-50	4936495								鳥取港着岸後	
8												

航路 戸畑から鳥取　　トランスマスター OFF

空船

(2-2) The results of the second navigation test ： Test data (4)

(a) Duration from "Tobata Port" to "Tottori Port" ： 20 hours 50 minutes.
(b) Fuel consumption ： 3,845 liters.

D. Explanation of navigation test data：(B-2)

(a) The first navigation test result

(a-1) Duration by navigation test in the state of "ON" with "Trans-master"
Appliance：20 hours 05 minutes.

(a-2) Fuel consumption : 3,692 liters.

(b) The second navigation test result,

    (b-1) Duration by navigation test in the state of "OFF" with "Trans-master" appliance : 20 hours 50 minutes.

    (b-2) Fuel consumption : 3,845 liters.

(c) The decrease rate of the fuel consumption by "Trans-master" appliance is got from the test results of item (a) and item (b).

    (c-1) The decrease rate of the fuel consumption expressed by fuel level indicator of a main engine : 4.0%.

    (c-2) The compaction time of navigation time : 45 minutes.

    (c-3) Compaction rate of navigation time : Enlargement rate of ship speed : 3.6.

E. Results of recent navigation tests,

    (a) Therefore, if the number of revolution of an engine is set beforehand in the decrease state of 3.6%　because the decrease rate of navigation time becomes 3.6%, the decrease rate of the fuel consumption is increased by additional 3.6%.

    (b) Therefore, the decrease rate of the fuel consumption with this experiment ship becomes 7.6% by adding 3.6% of item (d) to 4.o% of item (c).

    (c)The decrease rate of 7.6% of the fuel consumption mentioned above is the big numerical value that is not thought because 2% is the maximum decrease rate in the fuel technology of the conventional ship engine.

                                                end