

METROPOLITAN-VICKERS ELECTRICAL CO.LTD.

REPORT NO.ER.2693.

REPORT OF OFFICIAL TEST  
OF  
TURBINE AND REDUCTION GEARS

AT RUGBY, 29TH JUNE, 1936.

FOR: MESSRS. BARCLAY CURLE AND CO.LTD. FOR THE ELLERMAN LINES  
LIMITED.

3rd Machine.

RATING: 100 kW. AT 6500/800 RPM. 110 VOLTS.

TYPE OF TURBINE: N3C.14" 3 STAGE HIGH PRESSURE HORIZONTAL CURTIS

TYPE OF GENERATOR: COMPOUND WOUND WITH INTERPOLES. DRIP-PROOF.

TYPE OF GEARS: DOUBLE HELICAL SINGLE REDUCTION GEARS.

SHOP ORDER NOS. TURBINE B.802349. GEARS B.802352. GENERATOR 416260/2.

SERIAL NO. TURBINE R.1863 GENERATOR 416260/2/02.

TURBINE TESTS - Certified by (Signed) Ewd. H. Blade.  
Designing Engineer.

REPORT APPROVED. (Signed) Fred.H.Clough.  
Asst. Chief Engineer.

DATE - 6th JULY, 1936.



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METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

REPORT NO. E. 2632

REPORT OF OFFICIAL TEST  
ON  
TURBINE AND REDUCTION GEARS

AT HUGBY, 29TH JUNE, 1936.

FOR: MESSRS. BARCLAY, CURLE & CO. LTD. FOR THE ELLERMAN LINES LIMITED.

Turbine Machine.

RATING: 100 KW. AT 6500/800 RPM. 110 VOLTS.

TYPE OF TURBINE: 3 STAGE HIGH PRESSURE HORIZONTAL CURTIS

TYPE OF GENERATOR: COMPOUND WOUND WITH INTERPOLES. D.R.P.-PROOF.

TYPE OF GEARS: DOUBLE HELICAL SINGLE REDUCTION GEARS.

SHOP ORDER NOS. TURBINE B. 802349. GEARS B. 802352. GENERATOR A1660/S.

SERIAL NO. TURBINE R. 1863 GENERATOR A1660/S/02.

TURBINE TESTS - Certified by  
(Signed) H. H. Blagden  
Designing Engineer.

REPORT APPROVED.  
(Signed) Fred H. Clough  
Asst. Chief Engineer.

DATE - 6th JULY, 1936.

REPORT OF OFFICIAL TEST OF A 100 KW.  
GEARED TURBO GENERATOR

MESSRS. BARCLAY, CURLE & CO. LTD. FOR THE ELLERMAN  
LINES LIMITED.

TURBINE NO. R. 1863.

The official test on this machine was run on the 29th June, 1936 in the presence of Mr. Ward and Mr. Cairns of the Ellerman Line, Mr. Laing of Lloyds and Mr. Walker of B.O.T.

The test was commenced at 6.00 am with a load of 100-kW. on the generator, this load being maintained until 12 noon. During this load run a steam consumption test was taken for one hour.

On completion of the above, governing and overspeed tests were made, followed by a two hours' run at 125 kW. load.

During the afternoon a short test was run with a load of 70 kW. on the generator - the turbine exhausting against atmospheric back pressure. The load was then increased to 150 kW. and maintained for one and a half minutes.

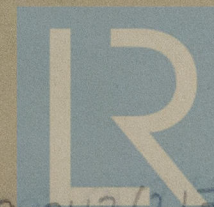
At each load at which a steam consumption was taken the set was run until the conditions were steady and then simultaneous readings at intervals of 3 minutes were taken of steam pressure, temperature, pressure at exhaust, weight of condensed steam and output of the generator.

The figures have been analysed and tabulated in Tables 2 and 3.

Correction curve No. TEC. 3026.A. is bound in with the report, this having been used for correcting the test figures when operating to vacuum, to the guaranteed conditions.

Table No. 1 gives general details of the set.

Table No. 4 gives particulars of governing trials and overspeed tests.



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REPORT OF OFFICIAL TEST ON A 100 KW.  
GEARED TURBO GENERATOR

MESSRS. BARKLEY, GUNLE & CO. LTD. FOR THE ELLERRE  
LINES LIMITED.

TURBINE NO. R. 1863.

The official test on this machine was run on the 29th June, 1936 in the presence of Mr. Ward and Mr. Cairns of the Kilmarnock Line, Mr. Laing of Dlayda and Mr. Walker of B.C.T. The test was commenced at 8.00 am with a load of 100-KW. on the generator, this load being maintained until 12 noon. During this load run a steam consumption test was taken for one hour.

On completion of the above, governing and overspeed tests were made, followed by a two hours' run at 125 KW. load.

During the afternoon a short test was run with a load of 70 KW. on the generator - the turbine exhausting against atmospheric back pressure. The load was then increased to 150 KW. and maintained for one and a half minutes.

At each load at which a steam consumption was taken the test was run until the conditions were steady and then simultaneous readings at intervals of 3 minutes were taken of steam pressure, temperature, pressure at exhaust, weight of condensed steam and output of the generator.

The figures have been analysed and tabulated in Tables 2 and 3.

Correction curve No. TBC. 3086.A. is bound in with the report, this having been used for correcting the test figures when operating to vacuum, to the guaranteed conditions.

Table No. 1 gives general details of the test.

Table No. 4 gives particulars of governing trials and overspeed tests.

TABLE NO. 1.

TURBINE NO. R. 1863.

TURBO GENERATOR.

NORMAL OUTPUT

100 KW.

SPEED.

6500/800 RPM.

TURBINE.

TYPE

H3C.14.

3 STAGE HIGH PRESSURE  
HORIZONTAL CURTIS.

TYPE OF BLADING.

IMPULSE

NUMBER OF ROTATING  
ROWS PER STAGE

2 ROWS PER STAGE

SPECIFIED STEAM PRESSURE

150 LBS. PER SQ. INCH GAUGE.

SPECIFIED STEAM QUALITY.

DRY STEAM

SPECIFIED VACUUM INS. HG.

28"

REDUCTION GEARS.

TYPE

DOUBLE HELICAL SINGLE  
REDUCTION GEARS.

GENERATOR.

TYPE

COMPOUND WOUND WITH INTERPOLES.  
DRIP-PROOF.



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TABLE NO. 2.

TURBINE NO. R.1863.

TEST NO.

DATE

DURATION

OUTPUT OF GENERATOR

SPEED.

STEAM CONDITIONS

PRESSURE AT TURBINE LBS/SQ.IN.G.

TEMPERATURE AT TURBINE OF

SUPERHEAT OF.

EXHAUST.VACUUM AT EXHAUST INS.MERCURY  
BAROMETER - 30"STEAM CONSUMPTION.

TOTAL WATER WEIGHED PER HOUR

WATER USED PER KW. HOUR.

CORRECTIONS.

PRESSURE

SUPERHEAT

VACUUM

TOTAL

STEAM CONSUMPTION LBS/KW.HR.)  
CORRECTED TO 150 LBS/SQ.IN.G.)  
DRY STEAM, 28" VACUUM.I  
29th JUNE, 1936.

10.15 to 11.15 am.

100 kW.

6500/800 RPM.

146.8

393.5

29.3

27.03"

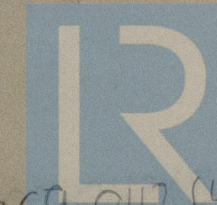
2822 lbs.

28.22 lbs.

 $\frac{1}{1.0035}$  $\frac{1}{0.9805}$  $\frac{1}{1.0622}$ 

0.960

27.09 LBS/KW.HR.



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TABLE NO. 3.  
TURBINE NO. R.1863.

TEST NO. 1  
DATE 29th JUNE, 1936.  
DURATION 10.15 to 11.15 am.  
OUTPUT OF GENERATOR 700 KW.  
SPEED 6500/800 RPM.

STEAM CONDITIONS  
PRESSURE AT TURBINE LBS/SQ.IN.G. 146.8  
TEMPERATURE AT TURBINE OF 393.5  
SUPERHEAT OF 29.3

EXHAUST  
VACUUM AT EXHAUST INS. MERCURY 27.03"  
TOTAL WATER WEIGHED PER HOUR 28.22 lbs.  
WATER USED PER KW. HOUR 28.22 lbs.

CORRECTIONS  
PRESSURE 1.0035  
SUPERHEAT 0.0005  
VACUUM 1.0035  
TOTAL 0.0075

STEAM CONSUMPTION LBS/KW.HR. 27.09  
CORRECTED TO 150 LBS. PER SQ.IN. G. DRY STEAM, 28" VACUUM.

TABLE NO. 3.  
TURBINE NO. R.1863.

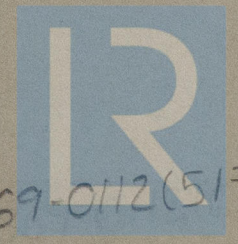
TEST NO. 2  
DATE 29th JUNE, 1936.  
DURATION 3.00 to 3.15 pm.  
OUTPUT OF GENERATOR 70 KW.  
SPEED 6500/800 RPM.

STEAM CONDITIONS  
PRESSURE AT TURBINE LBS/SQ.IN.G. 144.2  
TEMPERATURE AT TURBINE OF 387.25  
SUPERHEAT OF 24.35

EXHAUST  
BACK PRESSURE LBS/SQ.IN.ABS. 13.42

STEAM CONSUMPTION  
TOTAL WATER USED PER HOUR. 3940  
WATER USED PER KW. HOUR. 56.28

CORRECTIONS  
B.T.U.'s AVAILABLE PER LB/ AT 177.0  
TEST CONDITIONS.  
B.T.U.'s AVAILABLE PER LB/STEAM AT } 176.37  
150 LBS./SQ.IN.G. DRY STEAM }  
14.7 LBS/SQ.IN.G. B.P. }  
TOTAL THEORETICAL CORRECTION. 1.0035  
STEAM CONSUMPTION IN LBS/KW.HR. } 56.48  
CORRECTED TO 150 LBS. PER SQ.IN. G. }  
DRY STEAM AND 14.7 LBS. PER SQ.IN. }  
ABSOLUTE.



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TEST NO.	DATE	DURATION	OUTPUT OF GENERATOR	SPEED	STEAM CONDITIONS	TEMPERATURE AT TURBINE OF	SUPERHEAT OF	EXHAUST	BACK PRESSURE LBS/SG. IN. ABS.	STEAM CONSUMPTION	TOTAL WATER USED PER HOUR	WATER USED PER KW. HOUR	CORRECTIONS	B.T.U.'s AVAILABLE PER LB. AT	TEST CONDITIONS	B.T.U.'s AVAILABLE PER LB. OF STEAM AT	150 LBS. /SG. IN. G. DRY STEAM	14.7 LBS. /SG. IN. G. B.P.	TOTAL THEORETICAL CORRECTION	STEAM CONSUMPTION IN LBS./KW. HR. CORRECTED TO 150 LBS. PER SG. IN. G. DRY STEAM AND 14.7 LBS. PER SG. IN. ABSOLUTE
5	29th JUNE, 1936.	3.00 to 3.15 pm.	70 KW.	6500/800 RPM.	144.5	387.25	24.35	17.42	3940	56.28				177.0	176.37	1.0035				56.48
TURBINE NO. R.1863.																				
TABLE NO. 3.																				

TABLE NO. 4.  
TURBINE NO. R.1863.  
GOVERNING.

The following governing readings were obtained with a load of 100 kW. thrown off and on the generator.

				1st Trial.	2nd Trial.	
Load on generator governing steady at				6500	6500	R.P.M.
" off " momentary speed				6900	6850	"
" off " steady " "				6600	6620	"
" on " momentary " "				6470	6470	"
" on " steady " "				6500	6500	"

The maximum momentary speed variation is therefore 6.66% and the steady speed maximum variation is 1.85%.

The emergency governor tripped at

1st Trial	7100	R.P.M.
2nd "	7050	"
3rd "	7100	"

The set was run at 15% overspeed i.e. 7475 R.P.M. for 5 minutes.



T.E.C. 3026A.

PRESSURE, SUPERHEAT & VACUUM CORRECTIONS

CORRECTION.

1.08  
1.07  
1.06  
1.05  
1.04  
1.03  
1.02  
1.01  
1.00  
.99  
.98  
.97  
.96  
.95

120

130

140

150

160

170

180

PRESSURE LBS. PER SQ. IN. GAUGE.

0

10

20

30

40

50

60

SUPERHEAT °F.

27.0

VACUUM INS.

27.5

28.0

28.5

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