Plant & Instrument Air

Cooling Water

145C-O

103J
Process Air Compressor

Total Work = 7.2 MW

Total Cooling Water Duty = 4.49 MW

Cooling Water

145C-C

Cooling Water

145C-E

34.1 barg
176 °C

Ambient Air

0 barg
10 °C

10

Steam to Process Air

11
38.0 barg
345 °C

34.1 barg
261 °C

Ambient Air

0 barg
10 °C

29
0.08 barg
17 °C

Total Work = 0.35 MW

106J
Combustion Air Compressor

150D
Pre-Reformer

To / From Steam Drum 101F

Ambient Air

0 barg
10 °C

21a

2 barg
11 °C

21

8
34.4 barg
444 °C

20a

2 barg
11 °C

20

105B
Auxiliary Boiler

33.4 barg
489 °C

32.7 barg
497 °C

12

103D
Secondary Reformer

To / From Steam Drum 101F

HP Steam

32.2 barg
807 °C

9

13
31.5 barg
994 °C

101C A/B
Primary High Pressure Steam Boilers
Duty = 58.67 MW

31.2 barg
390 °C

102C
Steam Superheater
Duty = 5.03 MW

0.08 barg
190 °C

31.0 barg
336 °C

2 barg
11 °C

19

2 barg
11 °C

22

Fuel from PRISM

23
10.6 barg
50 °C

Flue Gas Temperature =145 °C

2 barg
11 °C

24

C146

Cold Leg

Hot Leg

HP Steam

J

K5

36.2 barg
357 °C

K4

33.4 barg
341 °C

F2

HP Steam

H

Superheater Burners

K2

BFW

BFW

L-M

G

39.4 barg
112 °C

N

O

F1

35.4 barg
494 °C

2 barg
190 °C

28

Tunnel Burners

27
2 barg
190 °C

Total Work = 0.50 MW

101 BJ
ID Fan

C135

Denox

TC

13.4 barg
-19 °C

25

Purge Gas

26
2 barg
190 °C

Fuel Gas

3
40.2 barg
30.5 °C

2

Feed Gas

40.2 barg
30.5 °C

Natural Gas

1

40.5 barg
30.5 °C

118F
Natural Gas KO Drum

4

38.2 barg
50 °C

38.2 barg
340 °C

38.2 barg
332 °C

5

107D & 108D
Desulphurisers
NOTE 1

7
36.5 barg
330 °C

109D
Co-Mo Reactor

37.3 barg
337 °C

36.5 barg
327 °C

Desulphurisation Gas

Process Steam

TC

6
38.0 barg
345 °C

104D
High Temperature Shift Converter

To / From Steam Drum 101F

To / From Methanator Inlet

BFW

Fully Open

30.4 barg
410 °C

14

103C
Secondary High Pressure Steam Boiler

Duty = 9.16 MW

30.0 barg
313 °C

104C
Methanator Preheater

Duty =11.34 MW

29.9 barg
192 °C

151C
Trim Boiler Feed Water Preheater

Duty = 0 MW

TC

29.8 barg
192 °C

104D S
Low Temperature Shift Converter
NOTE 1

104D N
Low Temperature Shift Converter

BFW

To / From E102 A/B

BFW Makeup / Demin

15
29.3 barg
212 °C

153C
Boiler Feed Water Preheater
Duty = 6.32 MW

28.9 barg
165 °C

105C A/B
CO_2 Desorption Column Reboilers
Duty = 24.57 MW

28.3 barg
119 °C

106C
Boiler Feed Water Preheater
Duty = 12.08 MW

28.0 barg
64 °C

16
28.0 barg
64 °C

Process Gas to CO_2 Removal

102F
Process Condensate KO Drum

17
28.0 barg
64 °C

To Atmosphere

F1005

0 barg
64 °C

E1010
Atmospheric Process Condensate KO Drum

3 barg
66 °C

18

Process Condensate to Stripper 1020E

J101S
Process Condensate Pump

101B
Primary Reformer

Name	Duty [MW]	
Radiant Duty	67.80	
Losses	3.20	
F1 – Mixed Feed Preheater	9.58	
G – Steam & Air Heater	2.87	
H – Steam Superheater	17.29	
F2 – Mixed Feed Re-Heater	3.54	
Auxiliary Boiler Duty	18.91	(50 t/h HP Steam)
J – Steam Superheater	12.94	
K5 – Mixed Feed 1st Preheater	1.89	
K4 – 1st Air Heater	2.69	
K2 – 2nd Feed Preheater	4.08	
L – M – Boiler Feed Water Heater	15.63	
N – Feed Preheater	1.26	
O – Fuel Preheater	1.19	
C135 – Combustion Air Preheater	8.68	
Total Heat Recovery	**168.36**	
Fuel In	171.73	
Recovered Heat In (Coil O and C135)	9.87	
Total Heat In	**181.6**	
Overall Efficiency	**92.7%**	

NOTES

1. **107D and 104D S are not in operation**
2. **All values are from the Aspen Plus model of the October 2014 Testrun: Terte Ammonia Oct 2014.bkp**

REVISIONS

Rev.	Date	Description	Owner	Checker	Approver
02	06/04/2016	Second Issue	DGI	BWA	MWA
01	08/01/2016	First Issue	DGI	BWA	MWA

YARA

YARA Tertre
August 2014 Plant Test Operating Conditions

Process Flow Diagram – Primary Reformer and Front End Equipment

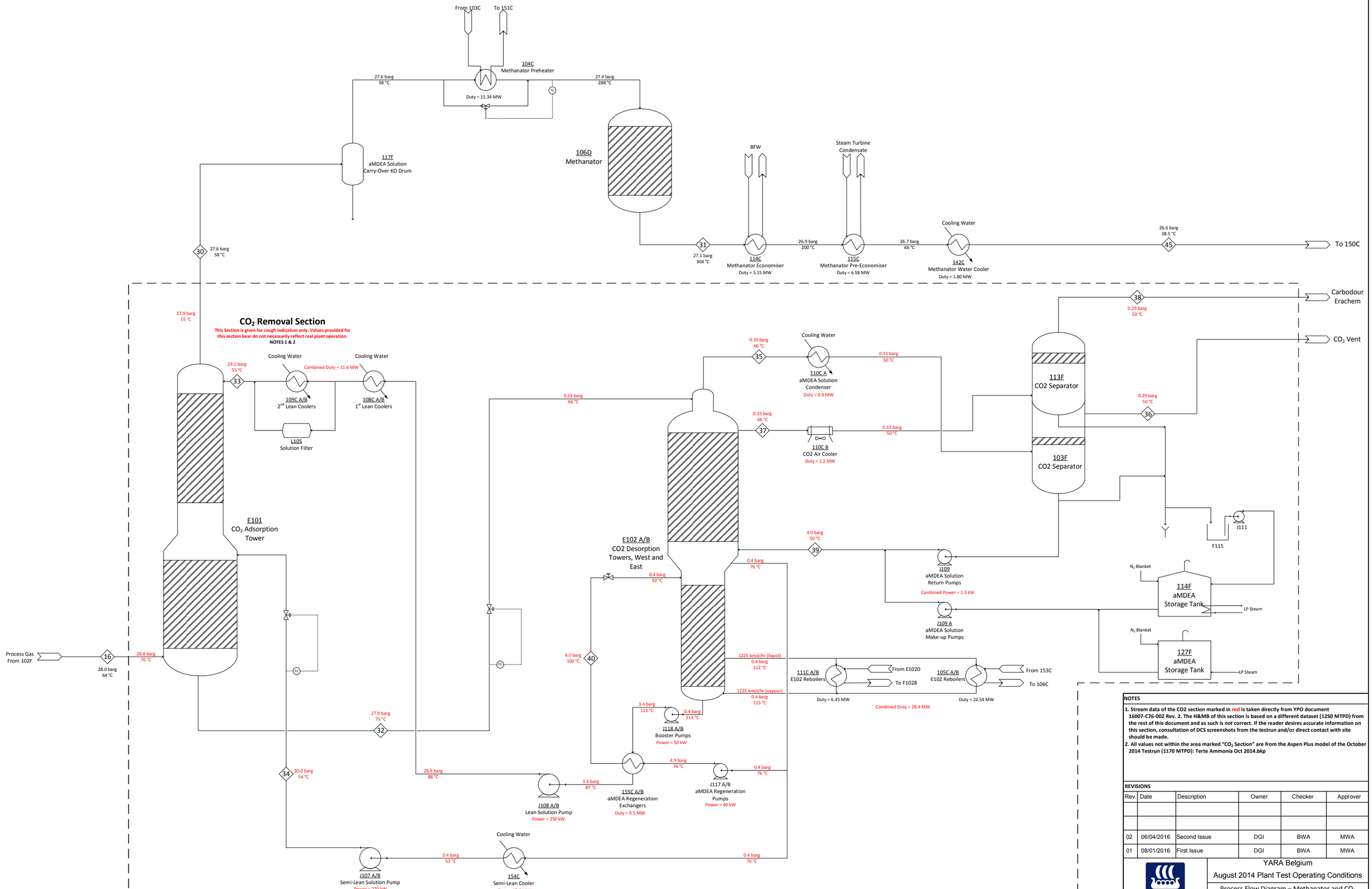
YARA Tertre
Rue de la Carbo 10,
7333 Tertre

PROJECT: Ammonia Plant LTA

DWG N°

REV: 02

SHEET 01 OF 05



NOTES

1. **Stream data of the CO2 section marked in red is taken directly from YPO document 16007-C76-002 Rev. 2. The H&MB of this section is based on a different dataset (1250 MTPD) from the rest of this document and as such is *not* correct. If the reader desires accurate information on this section, consultation of DCS screenshots from the testrun and/or direct contact with site should be made.**
2. **All values not within the area marked "CO_2 Section" are from the Aspen Plus model of the October 2014 Testrun (1170 MTPD): Terte Ammonia Oct 2014.bkp**

REVISIONS

Rev.	Date	Description	Owner	Checker	Approver
02	06/04/2016	Second Issue	DGI	BWA	MWA
01	08/01/2016	First Issue	DGI	BWA	MWA

YARA

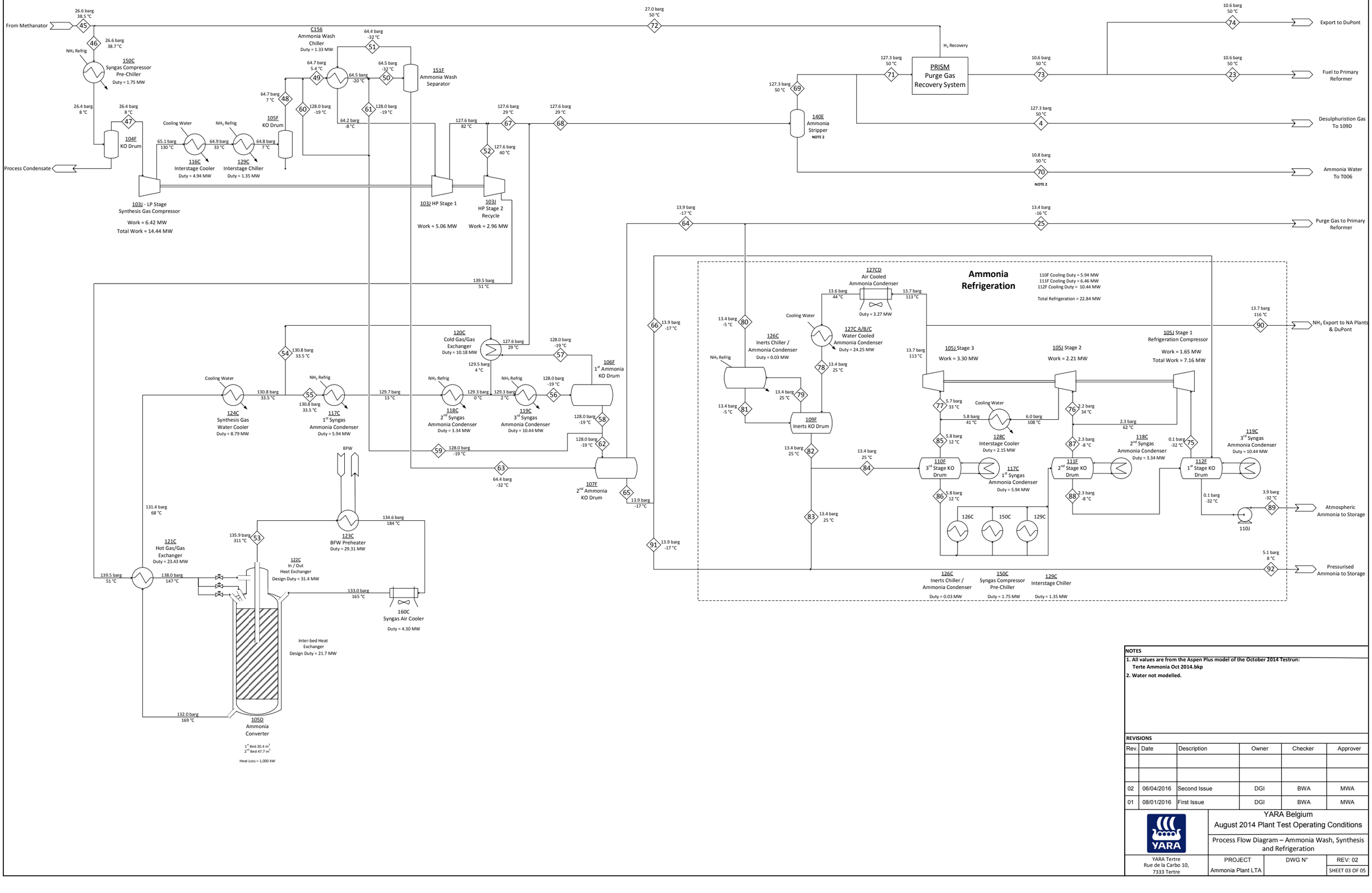
YARA Tertre
Rue de la Carbo 10,
7333 Tertre

YARA Belgium

August 2014 Plant Test Operating Conditions

Process Flow Diagram – Methanator and CO_2 Removal

PROJECT	DWG N°	REV: 02
Ammonia Plant LTA		SHEET 02 OF 05



NOTES

1. **All values are from the Aspen Plus model of the October 2014 Testrun: Terte Ammonia Oct 2014.bkp**
2. **Water not modelled.**

REVISIONS

Rev.	Date	Description	Owner	Checker	Approver
02	06/04/2016	Second Issue	DGI	BWA	MWA
01	08/01/2016	First Issue	DGI	BWA	MWA

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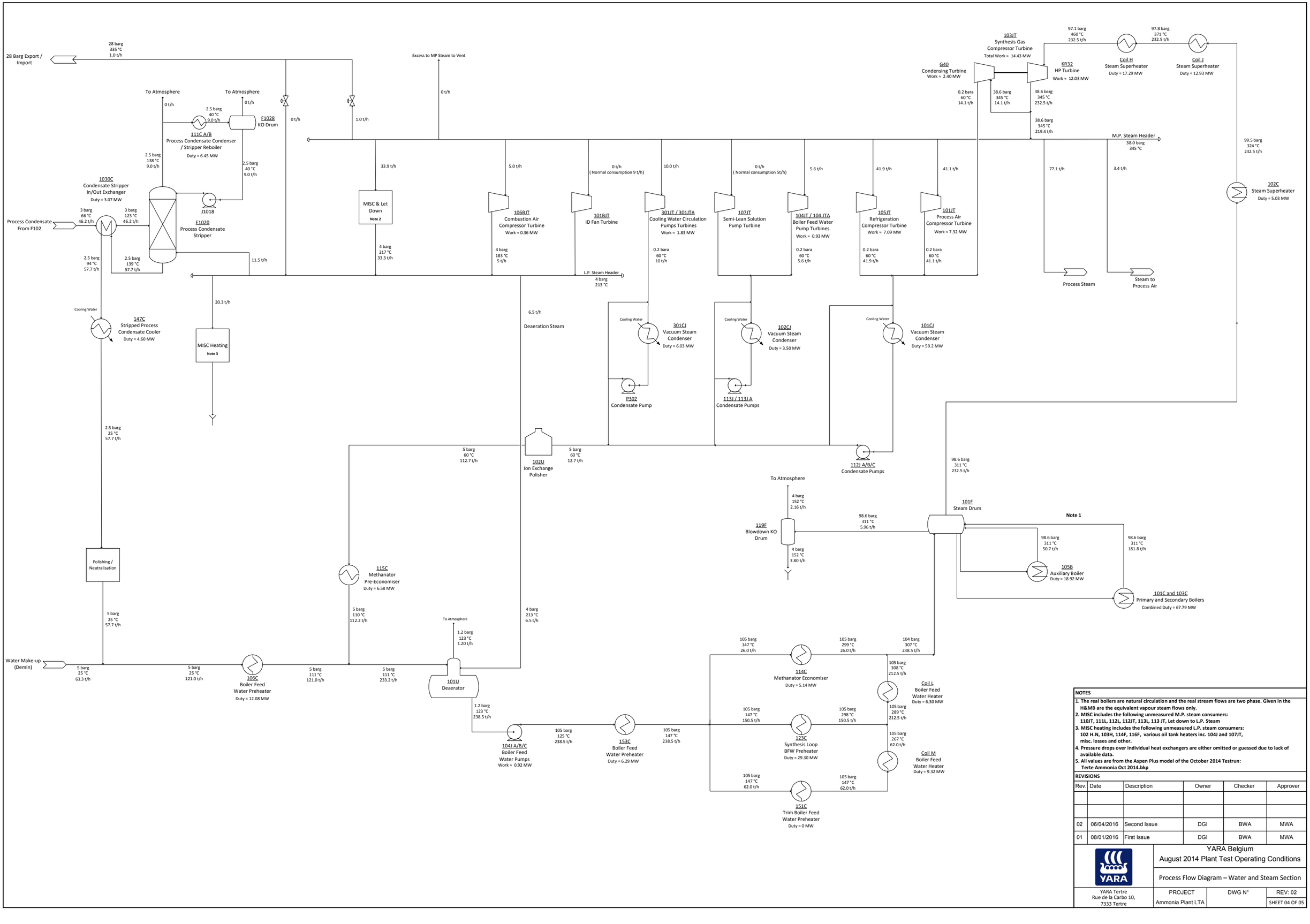
August 2014 Plant Test Operating Conditions

Process Flow Diagram – Ammonia Wash, Synthesis and Refrigeration

YARA Tertre
Rue de la Carbo 10,
7333 Tertre

PROJECT	DWG N°	REV: 02
Ammonia Plant LTA		SHEET 03 OF 05



NOTES

1. The real boilers are natural circulation and the real stream flows are two phase. Given in the H&MB are the equivalent vapour steam flows only.
2. MISC includes the following unmeasured M.P. steam consumers: 110JT, 111L, 112L, 112JT, 113L, 113 JT, Let down to L.P. Steam
3. MISC heating includes the following unmeasured L.P. steam consumers: 102 H.N, 103H, 114F, 116F, various oil tank heaters inc. 104J and 107JT, misc. losses and other.
4. Pressure drops over individual heat exchangers are either omitted or guessed due to lack of available data.
5. All values are from the Aspen Plus model of the October 2014 Testrun: Terte Ammonia Oct 2014.bkp

REVISIONS

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YARA Belgium

August 2014 Plant Test Operating Conditions

Process Flow Diagram – Water and Steam Section

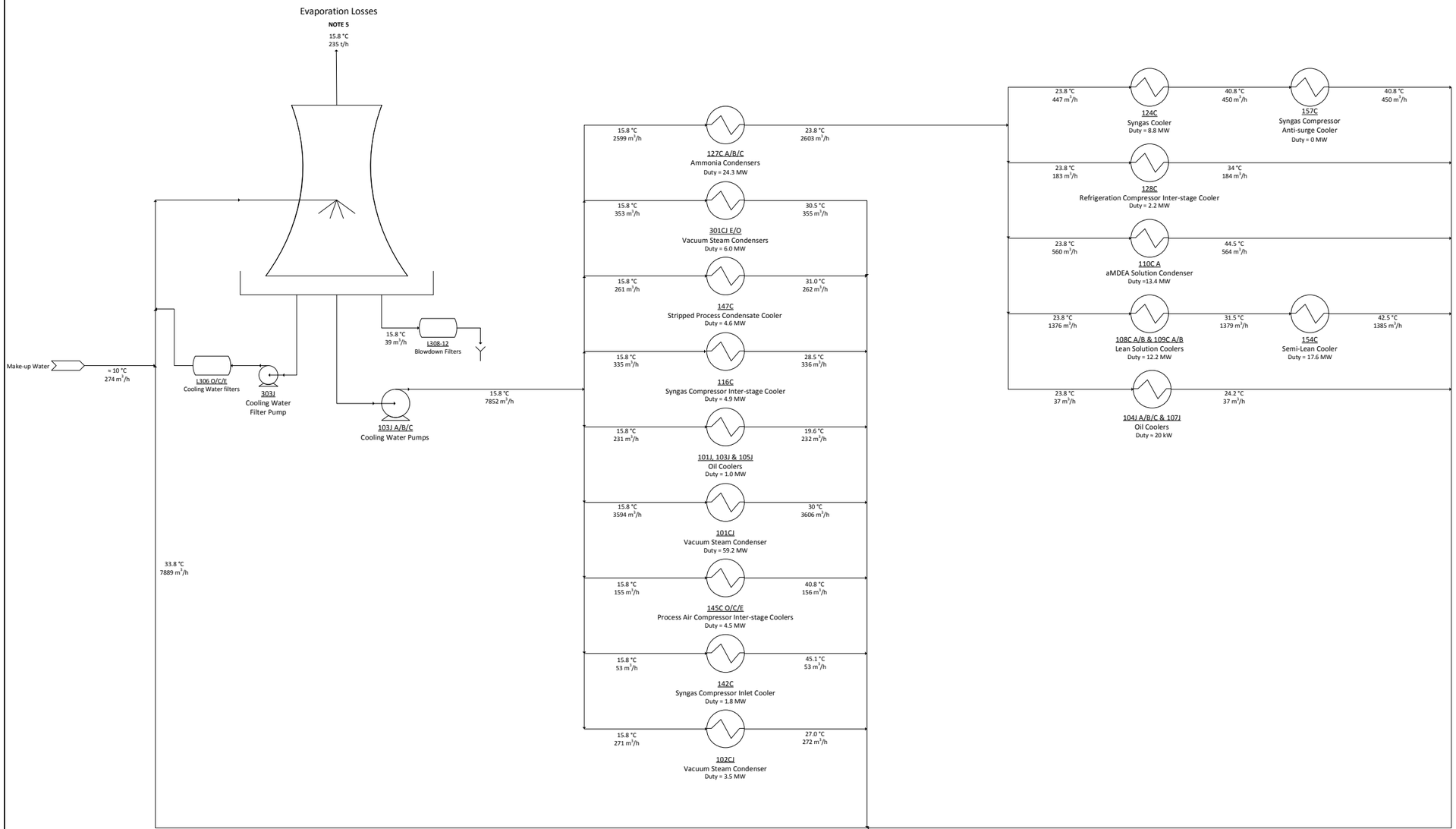
YARA Tertre
Rue de la Carbo 10,
7333 Tertre

PROJECT: Ammonia Plant LTA

DWG N°:

REV: 02

SHEET 04 OF 05



NOTES

1. **The density of water as a function of temperature has been included in the flowrates given.**
2. **Pressure is omitted due to lack of available data.**
3. **Process side duties are taken from the Aspen Plus model of the October 2014 Testrun: Tertre Ammonia Oct 2014.bkp**
4. **Temperatures and flowrates were measured 2 weeks prior to the testrun using manual, external measurements. As such the error of this H&MB of this section is high, the average error is likely to be around 10%.**
5. **Water loss stated represents the theoretical minimum. Actual losses will be higher. Leakages are not included.**

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YARA Belgium

August 2014 Plant Test Operating Conditions

Process Flow Diagram – Water and Steam Section

YARA Tertre
Rue de la Carbo 10,
7333 Tertre

PROJECT: Ammonia Plant LTA

DWG N°

REV: 02

SHEET 05 OF 05