FAT Procedure (incl. full unit mechanical run test procedure) (K-020)

REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
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LIST OF REVISED PAGES

Rev. / Page	01	02	03	04	05	01	02	03	04	05	Rev. / Page	01	02	03	04	05	Rev. / Page	01	02	03	04	05
1	X	X	X	X							**51**						**76**					
2	X	X	X	X							**52**						**77**					
3	X	X	X	X							**53**						**78**					
4	X	X	X	X							**54**						**79**					
5	X	X	X	X							**55**						**80**					
6	X	X	X	X							**56**						**81**					
7	X	X	X	X							**57**						**82**					
8	X	X	X	X							**58**						**83**					
9	X	X	X	X							**59**						**84**					
10	X	X	X	X							**60**						**85**					
11	X	X	X	X							**61**						**86**					
12	X	X	X	X							**62**						**87**					
13		X	X	X							**63**						**88**					
14		X	X	X							**64**						**89**					
15		X	X	X							**65**						**90**					
16											**66**						**91**					
17											**67**						**92**					
18											**68**						**ATTACHMENT**					
19											**69**						**1**					
20											**70**						**2**					
21											**71**						**3**					
22											**72**						**4**					
23											**73**						**5**					
24											**74**						**6**					
25											**75**						**7**					

1. Purpose

Checking the performance and functioning of the package against the approved documents and specifications.

Separate test reports for each test will be generated; however, this FAT procedure covers only the procedure to be performed on all skids.

2. Reference documents

2.1. Vendor documents

Please find below the reference vendor documents that will be used during this FAT.

N-278-VD-6019-PR-PID-0002-01	18841-03	P&ID
N-278-VD-6019-PR-GAD-0003-01	18841-04	General Arrangement Drawing
N-278-VD-6019-IN-DIA-0005-01	18841-05	Wiring Diagram (LCP and JB)
N-278-VD-6019-IN-DWG-0007-01	18841-07	Panel lay-out (LCP and JB)
N-278-VD-6019-GN-ITP-0008-01	18841-08	Inspection & Test Plan (ITP)
N-278-VD-6019-GN-PRO-0022-01	18841-21	Control Philosophy
N-278-VD-6019-GN-SF-0029-01	18841-27	Cause and Effect chart

2.2. Manufacturing data book

The manufacturing data book will also be available for review during the FAT. The MDB will be checked according to the approved MDB index and ITP.

The client or client TPI will sign the relevant pages as well as all relevant point of the ITP.

3. Scope

One (1) Instrument air booster compressor (K-020), Vertical piston compressor with motor driver (320-KM-020), outlet capacity 35 Nm3/hr, 30 bar(g) and inlet, 9,5 bar(g). 1 duty (1x100%). The compressor is water cooled at 4,5 bar(g) inlet pressure.

The test will include:

- Main motor (KM-020)
- Intercooler and aftercooler
- 4x pulsation damper
- Oil system
- Water system
- Local panel

The compressor is equipped with:

- One (1) LPS (Local Push Button Station)
- One (1) JB (Junction Box)

4. HSE

Standard safety precautions have to be taken since we are working with pressurised air.

- Proper PPE has to be worn when working / testing the package
- All visitors for the FAT will be instructed before the FAT, about Airpack safety precautions, by Airpack Safety movie.
- All visitors will be asked to sign a disclaimer to be able to enter the hazardous area during the test.
- The test area is cordoned off to make sure non-authorized personnel does not enter this area.

5. FAT Kick off meeting

Before starting the FAT there will be a short kick off meeting, where Airpack will explain the safety rules and regulations as well as what activities and planning will be performed during the FAT.

Kick-Off Meeting (KOM) Agenda.

i. Introduction/Sign in (along with the name, role/designation)
ii. HSE Induction
iii. FAT organization, roles and responsibilities of the personnel involved.
iv. Briefing on duration and sequence of tests planned, timing etc.

Also proper PPE will be distributed as required.

6. Roles and responsibilities

The project manager is responsible for the complete FAT. The project manager will arrange the persons who are required for each part of the FAT.

A qualified AIRPACK Technician who is familiar with the operational parameters of the Package will perform all FAT tasks

6.1. Problem resolution

If there are any problems during the FAT, they will be rectified immediately if possible, if not possible they will be recorded in the FAT punch list and resolved before shipment / commissioning of the package.

Please find attachment 1: Punch list format.

7. Test Instruments

The following test instruments will be used during the FAT, all instruments will have a valid calibration certificate which will be supplied as part of the FAT test results for checking and signing.

- Paint thickness meter
- Sound level meter
- Ambient pressure / temperature meter
- Multi meter (voltage check)

8. Utilities

The utilities that are available during FAT are:
- Power: 400V, 50Hz, 3ph and 230V, 50Hz, 1ph
- Cooling water supply: 4,5 bar(g), ~36 °C

9. Test procedure

Test may not be done in below order; it is subject to availability of personnel and equipment.

9.1. Mechanical checks

The Following will be tested / checked and recorded as part of the FAT. All checks are mentioned in attachment 2: Equipment checklist

Quality

1 Verify all equipment are installed in accordance with approved P&ID and GAD.
2 Visual inspection of the complete package for quality.
3 Verify piping, tubing location, orientation in accordance with approved GA Drawing.

P&ID review

1 Verify all components are installed as per the GA Drawing.
2 Check that all components are tagged according to the P&ID.
3 Check that the location is of the components is as per the GAD.

Dimensions

1 Dimensional check of the complete package for compliance to approved GA Drawing.
2 Verification and dimensional check of Tie-in Point, lifting points
3 Verification and dimensional check of foundation holes.

Painting

1 Check the overall paint for damages and overall quality.
2 Randomly check the thickness as per the approved paint procedure.
3 Check the paint color as per the paint procedure.

LPS and JB

1 Check for any loose connection in the control panel
2 Verify all control panel BOM, GA, wiring, I/O etc., matches approved drawings.
3 Check the installation and type of cable glands
4 Check the installation of the cable trays
5 Check the cable type

Instruments

1 Check for any loose connection of cables or wires in the instruments
2 Check the installation of the instruments as per approved drawings
3 Check if all instruments are tagged
4 Check the quantity of the instruments

9.2. Performance test (four hours)

Test set-up for the package is as follows:

- The power from the package will come from internal power supply
- 400V / 50Hz / 3ph and 230V / 50Hz / 1ph
- Power is ON

The following measurements will be taken during the performance test.

- Sound level at 1 metre distance from skid (max. 85 dB(A))
- The performance test will be done with ambient air. The related calculation for the outlet pressure can be found in attachment 6.
- Refer to Attachment 1 for an example of the performance test results sheet, which will be filled in during FAT.
- The piping will be sprayed and checked for leakage.

All in house instruments required / used during the test will have recent calibration certificated, which will be attached to the FAT test report.

The FAT recordings can be found in attachment 3: Performance test results

9.3. Noise level measurement

Noise test will be done during the performance test. Measuring points will be defined by a distance of 1 metre from the package and measured round the package. Final measuring point will be the same as start measure point. This is for checking correct functioning of the noise level meter.

Noise level shall not exceed 85 dB(A) for complete package at 1 metre distance (with package test blow off muffler closed).

The measurement will be recorded in attachment 4: Noise test results.

9.4 Vibration measurement

Vibration measurement will be done with job vibration transmitter unless they cannot be used. In that case a handheld analyser will be used.

The vibration is measured on the points as stated in attachment 4: Vibration test results, the values are recorded there as well.

The vibration level should not exceed 10 mm/s at the compressor and the motor.

Punch List Air Compressor Package

Project: 17735-GEN

Revision	04	
Dry Test		
Inhouse Test		
FAT		
F. Inspection		
Shipment		
Commissioning		

Item	Description	Point raised by	Action by	Completion before	Closed [date] [name]
001					
002					
003					
004					
005					
006					
007					
008					
009					
010					
011					
012					
013					
014					
015					
016					
017					
018					
019					
020					
021					
022					
023					
024					
025					
026					

FAT TEST PROCEDURE

Equipment	K-020
Customer	Lavan Industry Development Company (LIDCO)
Serial number	T-2023-00799
Project name	Integrated Methanol and Ammonia Plant
Airpack reference number	17735-COM
Date	8-1-2024
Revision	04
Document number	17735-14 Attachment 2
Handled by	SK
Number of pages	01 of 01

INSPECTION	DOCUMENT	COMPLETED	REMARKS
Quality			
1. Installation of main equipment	GAD / PID		
2. Visual inspection of overall quality	GAD / PID		
3. piping, tubing location / orientation	GAD / PID		
P&ID review			
1. Component check	P&ID		
2. Tagging of all components	P&ID		
3. Component location	P&ID		
Dimensions			
1. Overal skid dimensions	GAD		
2. Tie-in point dimensions	GAD		
3. Foundation bolt holes	GAD		
Painting			
1. Overal Paint quality	Paint procedure		
2. Painf DFT measurement	Paint procedure		
3. Paint color	Paint procedure		
Control Panel			
1. Loose connections	Wiring diagram / Panel lay-out		
2. BOM	Wiring diagram / Panel lay-out		
3. Cable glands	Wiring diagram / Panel lay-out		
4. Cable trays	Wiring diagram / Panel lay-out		
5. Cable type	Wiring diagram / Panel lay-out		
Instruments			
1. Loose connections	Wiring diagram		
2. Installation	P&ID		
3. Tagging	P&ID		
4. quantity	P&ID		

Airpack Test Engineer	Client Inspector

Notes:

FAT TEST PROCEDURE

Equipment	K-020
Customer	Lavan Industry Development Company (LIDCO)
Serial number	T-2023-00799
Project name	Integrated Methanol and Ammonia Plant
Airpack reference number	17735-COM
Date	8-1-2024
Revision	04
Document number	17735-14 Attachment 3
Handled by	SK
Number of pages	01 of 01

Performance Test Results

	00:00	00:30	01:00	01:30	02:00	02:30	03:00	03:30	04:00	UNIT	OPERATING VALUES
320-PT-8201	START									bar(g)	9,5
320-TT-8201										°C	46
320-TT-8202										°C	157
320-PT-8202										bar(g)	23,3
320-TT-8203										°C	60
320-TT-8204										°C	116
320-TT-8205										°C	60
320-PG-8203										bar(g)	30
320-PT-8203										bar(g)	30
320-PG-8204										bar(g)	4,5
320-TG-8205										°C	max 46
320-PT-8204										bar(g)	1,5

Running test starting time:		
Humidity:		R.H.%
Ambient temperature:		°C
Ambient pressure:		hPa

Airpack Test Engineer	Client Inspector

Notes:

Integrated Methanol and Ammonia Plant

Document n° : 17735-14 attachment 4

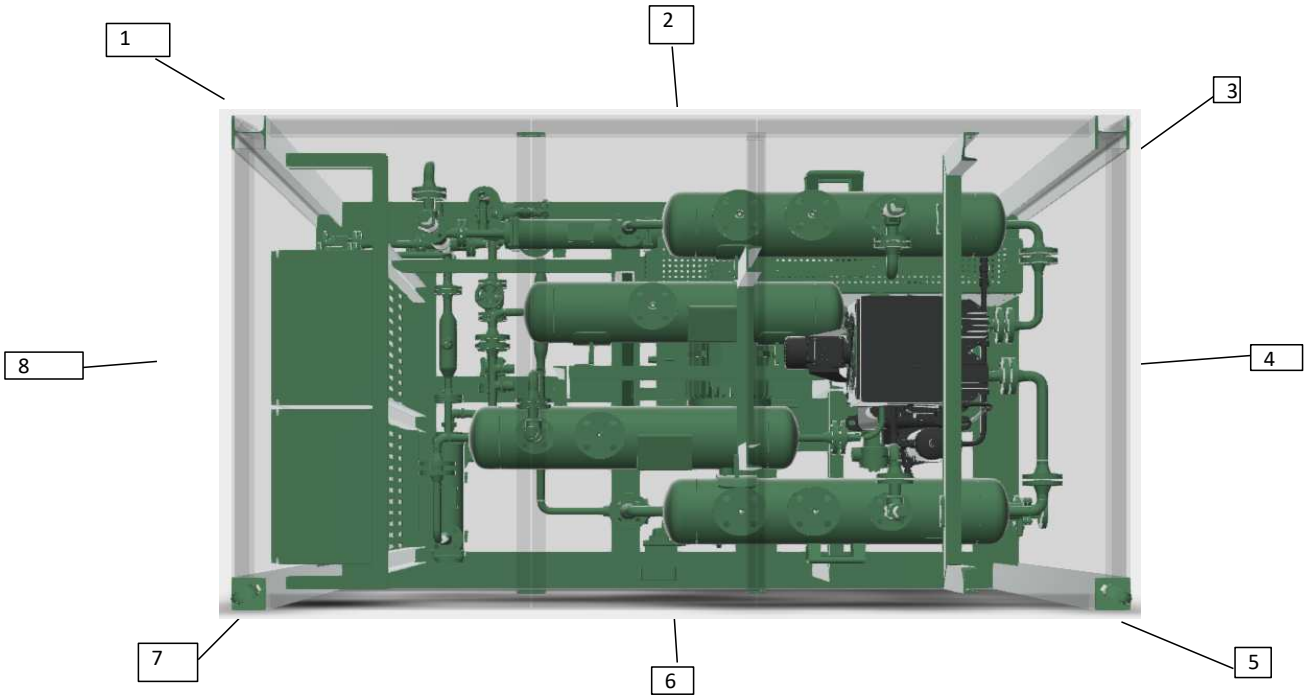
Revision : 04

NOISE LEVEL

Unit : K-020
Service : Air booster compressor
Supplier : Airpack
Serial No. : T-2023-00799

Client: Lavan Industry Development Company (LIDCO)
Contractor: Nargan Company
Project: Integrated Methanol and Ammonia Plant

Supplier to Complete
Expected Noise Level Data



Noise test has been performed during performance test:

Procedure:
Measure point will be defined by a distance of 1 metre from the package and 1,5 metre above the ground level to measured round the package. Final measure points will be the same as start measure points. This is for checking correct functioning of the noise level meter. Noise shall not exceed 85 dB(A) for complete package. Noise meter calibration certificate is available during test

Points	Unit	Noise Estimated	Noise measured	Average of anti logs	Noise level (Logarithmic Avg)	Noise level (Arithmetic Avg)
P1	dB(A)	83				
P2	dB(A)	84				
P3	dB(A)	85				
P4	dB(A)	85		1	0	0
P5	dB(A)	85				
P6	dB(A)	84				
P7	dB(A)	83				
P8	dB(A)	83				

Surrounding Noise measured (dB(A)) : 85

Noise level (After correction(If required) as per 5.3 of ISO 2151):

Correction Factor	
Level increase due to	Value to be subtracted from measured

Test Condition : Noise level test as per ISO 2151

Test Result:

Tested By :

Date:

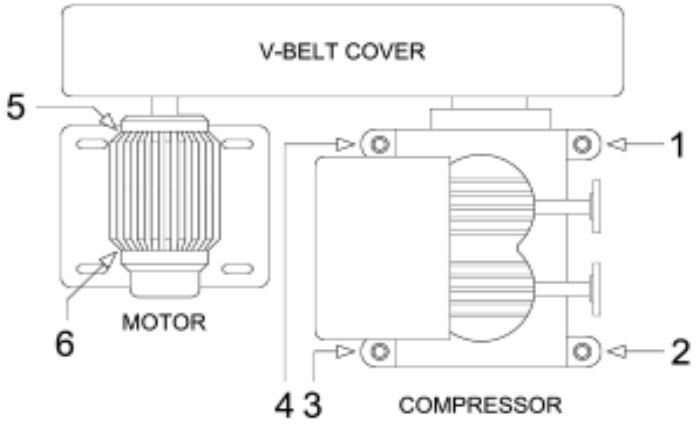
NOTE:

Project	:	**17735-14**
Equipment	:	**K-020**
Date	:	**8-1-2024**
Test Engineer(s)	:	

Vibration Test Report

Measurement points no.as sketch	**Measurement quantity: r.m.s. overall values (2 Hz. A 1000 Hz)**					
	Speed	**Power**	**H** horizontal mm/s. (M)	**V** vertical mm/s. (M)	**L** axial mm/s. (M)	**Notes**
	rev/min.	kW.				
Measure point tag no:						
Point 1, compressor frame						
Point 2, Compressor frame						
Point 3, Compressor frame						
Point 4, Compressor frame						
Avarage:						
Point 5, Motor drive end						
Point 6, Motor non drive end						
Avarage:						

TOP VIEW SCEMATIC



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FAT TEST PROCEDURE CALCULATION

Equipment	K-020
Customer	Lavan Industry Development Company (LIDCO)
Serial number	T-2023-00799
Project name	Integrated Methanol and Ammonia Plant
Airpack reference number	17735-COM
Date	30-1-2024
Revision	04
Document number	17735-14 Attachment 6
Handled by	TT
Number of pages	01 of 01

Operation with ambient air at the inlet			
Suction conditions	1	bar absoluut	
Discharge pressure	6	bar absoluut	
Working speed	410	rpm	
Vollume flow. Approx.	3,2	Nm^3/h	
Power requirement approx	1	kW	
Gas temperature 1st stage approx	112	°C	
Suction temperature 2nd stage approx	40	°C	
Gas temperature 2nd stage approx	123	°C	
max opperating time	24	hr	

Notes:
The machine operates at a 10 times smaller inlet pressure and at a pressure ration of approx. 6 instead of approx. 3.