

Anhydro Small Scale Spray Dryer

Type: MicraSpray 150

PROJECT: HOL1134
VERSION: 03

ORIGINAL INSTRUCTIONS
READ AND UNDERSTAND THESE INSTRUCTIONS PRIOR TO OPERATING OR SERVICING THIS
PRODUCT.



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1 Introduction

It is recommended to read this manual before starting up the Anhydro small scale spray dryer in order to ensure safe and correct operation. It is the user's duty to ensure that the operators and the technical personnel read and understand the safety instructions of the small scale spray dryer before installation and commissioning.

The Operation and Maintenance Instructions must be kept during the entire life of the Anhydro small scale spray dryer so that they are available when needed by the operator or the technical personnel. It is the user's duty to ensure that any updates of this manual received from SPX Flow Technology Danmark A/S during the entire life of the small scale spray dryer are added to the manual. The manual is considered part of the small scale spray dryer and must therefore always accompany this plant.



Note:

The information contained in this manual must neither be reproduced nor passed on to a third party without the permission of SPX Flow Technology Danmark A/S.

1.1 Pictograms in the manual

The following pictograms are used in the manual to highlight aspects which require special attention:



Note: Pay attention.



Important: Failure to observe the precautions may affect the functioning of the small scale spray dryer.



Warning: Danger to personal health and safety.

2 Safety instructions

This chapter describes the general safety instructions regarding installation, operation and maintenance of the Anhydro small scale spray dryer. Regarding safety in general, please refer to the Safety Instructions in the Operation and Maintenance Manual. Regarding safety in connection with the components, please refer to the Operation and Maintenance Instructions of the individual components.

2.1 General information

Neglect of the safety precautions mentioned in this manual may endanger:

- The safety of the operators and the technical personnel
- The proper operation of the small scale spray dryer
- Fulfilment of the requirements of product parameters

SPX Flow Technology Danmark A/S recommends that all work to be carried out on the small scale spray dryer, e.g. installation, operation, maintenance etc., is carried out by skilled personnel professionally trained to perform the specific work in question. Customized training can be ordered from SPX Flow Technology Danmark A/S, Soeborg. It is the user's duty to ensure that the operators of the small scale spray dryer have received the appropriate training.



Warning:

Electrical installations and repairs must be performed by a licensed electrician and in accordance with local standards and regulations.

It is the user's responsibility to assess any health hazard of the product (powder/granulate) being treated in the small scale spray dryer and to give guidance to the personnel in relation to possible danger by physical contact with the product and, if required, use of personal protection.

The information stated on the nameplate situated on the drying chamber is as follows:

SPX		SPX Flow Technology Danmark A/S, Oestmarken 7, DK-2860 Soeborg, Denmark www.spx.com	
Project	1	Year	4
Type	2		5
ID No	3	Weight	6
>Anhydro®			

Figure 5: Nameplate

The numbers in Figure 5 refer to: 1: Project No., 2: Type of small scale spray dryer, 3: Identification No., 4: Year of manufacture, 5: Optional information and 6: Total weight of the small scale spray dryer.

The information stated on the nameplate of your small scale spray dryer is as follows:

Project: HOL1134
 Type: MS150-1
 ID No: 53014
 Year: 2017
 Weight: 2300 kg.

2.3 Safety in connection with installation



Warning:

Electrical installations and repairs must be performed by a licensed electrician and in accordance with local standards and regulations.

V_1 = Volume of protected equipment

P_0 = Ambient pressure (14.7 psia or 1.013 bar abs)

ΔP = Pressure rise in the building (in same unit as P_0)

Generally, the drying chamber may as a maximum make up 1/9 of the free volume in the building in which the small scale spray dryer is placed as long as the building is made of reinforced concrete or vented. If the building is not made of reinforced concrete or vented, the drying chamber may as a maximum make up 1/15 of the free volume of the building.



Warning:

If the small scale spray dryer is equipped with an indoor vent, the following safety distances must be observed:

- **Personnel:** A distance equivalent to the diameter of the venting area of the indoor vent, unless a local regulation states otherwise
- **Equipment:** 0.7 m (2 ft)



Note:

It is the user's responsibility to ensure that the building in which the small scale spray dryer is placed can withstand the pressure increase calculated by means of the formula above.



Warning:

If the above-mentioned instructions are not followed, it could cause personal injuries.

2.5 Safety in connection with decommissioning

Decommissioning of the worn-out small scale spray dryer must be conducted safely and according to national regulations on occupational health and safety requirements. Furthermore, disposal must be conducted with due regard to environmental legal requirements.

The small scale spray dryer primarily consists of stainless steel and insulation materials. Insulation materials must be removed and disposed of according to local rules for disposal of waste materials. The stainless steel can be recycled.

3 Check on receipt and unpacking

3.1 Damage during transportation

Immediately on arrival the consignment should be checked for damages. However, if SPX Flow Technology Danmark A/S is in charge of/responsible for the installation of the unit/plant (supervision/completely), we recommend that only the packing is checked for damages (see section 3.2). If the packing is damaged, the consignment should be unpacked, the content inspected and checked according to the packing list(s).

In case of transportation damage, a complaint should immediately and without delay be made to the forwarder who is subject to a claim for damages. Furthermore, the insurance company insuring the transport should be notified; also SPX Flow Technology Danmark A/S, Soeborg should be informed. If SPX Flow Technology Danmark A/S is responsible and bears the risk of the transport, SPX Flow Technology Danmark A/S will notify the insurance company.

3.2 Unpacking



Note:

The unpacking instructions stated below are only intended as a guide. The small scale spray dryer may only be unpacked by personnel professionally trained to perform the specific work in question.

If SPX Flow Technology Danmark A/S is in charge of/responsible for the installation (supervision/completely) of the unit/plant, it is recommended that the consignment is not unpacked before the SPX FLOW Supervisor/personnel arrives.

Place the wooden box(es) and/or the bottom frame(s) on which the plant/plant components is/are placed near the place where the plant is to be installed. (A) Box(es) marked with arrows should be placed arrows up. Subsequently, the plant can be unpacked as follows:

If the plant/plant components is/are packed in (a) box(es), start by removing the ends of the box(es). Subsequently, remove the top and the props securing the plant/plant components.

4 The Anhydro small scale spray dryer

A wide range of products can be dried with satisfactory results in the Anhydro small scale spray dryer. The MS150 is specially designed to operate at low temperature and convert liquids into powders in small scale production.

Well-known spray dried products like milk powders of varying compositions, soap washing powders, tannin extracts, coffee extract, blood, plastic etc. can be dried in this plant. Furthermore, foodstuffs (cheese, eggs and bouillon), vegetables (bananas, tomatoes, pectin and soy beans), proteins and protein hydrolysates, enzymes, fungicides and vitamins together with many other organic and inorganic products can be dried in the Anhydro small scale spray dryer.

When exploring new production processes, it is very useful and important to determine the suitability of the products for the spray drying process.

The plant is also well suited for spray crystallisation, i.e. atomization of easily fusible products (e.g. fat and washing powders) without using heated drying air.

The MS150 provides various atomizer options. Therefore, the atomizer option and the drying process most suitable for the product in question must be selected.

4.1 Intended use

The MS150 is designed for operation with the product(s) and the capacity of product specified in the contract/order and in section 4.3 "Technical data".

4.2 Limitations of use

The Anhydro small scale spray dryer has been designed with focus on the greatest safety and operational stability possible. Failure to abide by these instructions may result in breakdown or serious injuries.

In general, the small scale spray dryer must not be operated when it is not in a technically perfect state. This especially applies when the malfunction in question could cause personal injuries. Furthermore, equipment ensuring safety and reliable function of the small scale spray dryer must not be overridden, disabled and/or changed.

4.3 Technical data

Nominal voltage for plant:	3x400V, 50Hz
Max. fuse for plant:	40 A
Max. evaporation capacity at inlet/outlet temperatures of 200/85°C:	3.9 kg/h
Drying chamber diameter:	0.9 m
Electric air heater power, main air:	15 kW
Max. compressed air consumption:	247 l/min
Max. compressed air pressure, connected:	6 bar
Controlled volumetric airflow from exhaust fan:	150 kg/h
Noise level exhaust fan:	85 dB
Dust explosion class:	ST1
Max. product K_{st} value:	199 bar m/s
Net weight:	2300 kg

4.4 Description of the MS150

All surfaces of the small scale spray dryer in contact with the product are produced in acid resistant stainless steel.

Counter current atomizer

A counter current atomizer is placed in the cone of the drying chamber and the product is led in the opposite direction of the drying air. The following type of atomizer can be used as counter current atomizer:

- Two-fluid nozzle atomizer

Atomization in general

When the plant is equipped with a nozzle atomizer, the product is led from the feed tank to the pipe nipple of the nozzle feed pipe. For the two-fluid nozzle valve the compressed air supply is connected to the inlet of the reduction valve (1/4"RG).

During centrifugal atomization, the product is led through the feed pipe of the atomizer and the liquid distributor to the quickly rotating atomizer wheel. The liquid is not under pressure, but it picks up spin from the atomizer wheel, and is forced out centrifugally through the radial holes, leaving the wheel periphery in a tangential line. Owing to the big holes in the atomizer wheel, the risk of clogging is minimal. The atomizer speed is variable and is controlled from the touch screen.

4.4.3 Single-stage mode

The powder follows the air stream down towards the conical drying chamber bottom and leaves the chamber along with the drying air.

The powder passes through the outlet cone and the powder duct to the cyclone separator. In the cyclone separator, the powder is separated from the drying air and falls down into the bottom of the cyclone, through the powder discharge valve and further down into the powder container (bucket). The moist drying air is sucked out of the cyclone top through the exhaust duct.

4.4.4 Control panel

The operator touch screen is placed on the front of the instrument panel. Here it is possible to control the following components:

- The temperature controller for outlet temperature with digital temperature reading and alarm, temperature regulation of inlet temperature and different alarm functions
- The start/stop function for: fan, centrifugal atomizer (optional), heater, feed pump (optional), chamber light, revolution governor for centrifugal atomizer (optional) speed and ammeter for centrifugal atomizer (optional) load

If the small scale spray dryer is equipped with a bag filter, the fines separate from the air in the filter are discharged through a butterfly valve situated at the bottom of the filter and collected in a powder container (bucket).

If the small scale spray dryer is equipped with a scrubber, the exhaust air is cleaned by spraying a water mist into the exhaust air which dissolves the fines or contains them in the water droplets.

4.6 General instructions about the drying process

The drying process can be illustrated on an I-x diagram for water vapour in air (see Figure 7).

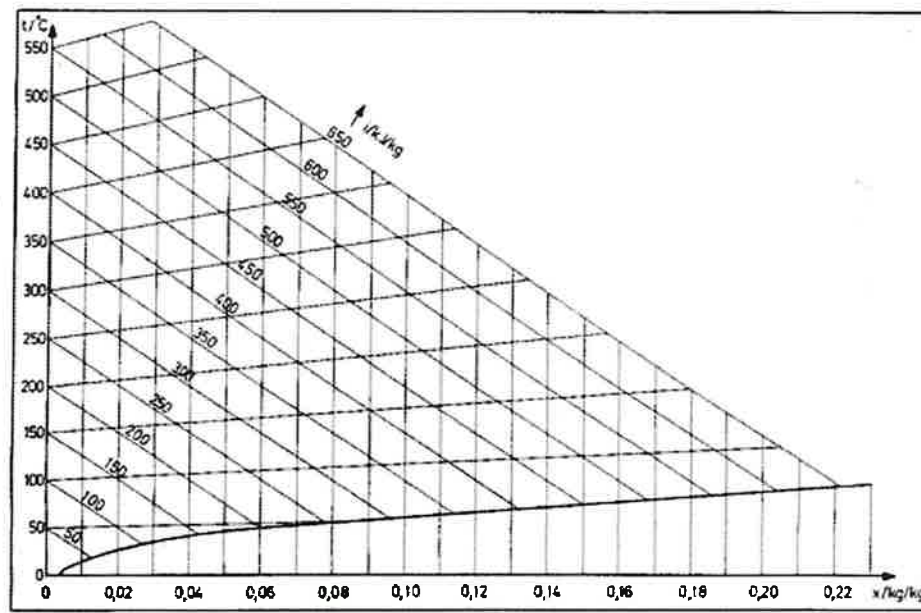


Figure 7: I-x diagram

If the ambient air has the initial state 0.01 kg H₂O/kg dry air and the air is heated to $T_i = 250^\circ\text{C}$, the evaporation takes place approximately along the oblique line for constant enthalpy = 250 kcal/kg dry air with x kg water vapour.

I = enthalpy (kcal) of 1 kg dry air with x kg water vapour.

x = kg water vapour/kg dry air.

From the diagram, you can read the water vapour content in the drying air for a given outlet air temperature.

If the inlet air temperature is increased while the outlet air temperature is kept constant, the water content in the powder increases (see Figure 7).

Nozzle atomization:

- Lower nozzle pressure
- Higher solids content in the feed

4.6.3 Factors affecting water content of powder

If the outlet air temperature is increased while the inlet air temperature is kept constant, the water content in the powder decreases.

Alteration	Effect
Higher inlet temperature	Higher capacity Lower water content in powder
Lower inlet temperature	Lower capacity Higher water content in powder
Higher outlet temperature	Lower capacity Lower water content in powder
Lower outlet temperature	Higher capacity Higher water content in powder
Higher solids content in feed product	Higher capacity Higher water content in powder Normally higher bulk density of powder and larger particles
Lower solids content in feed product	Lower capacity Lower water content in powder
Higher feed product temperature	Will affect the capacity and thus the particle size

5 Assembling/mounting



Note:

Incorrect assembling/mounting of the small scale spray dryer may result in damage to the plant. Therefore it is recommended that the assembling/mounting of the small scale spray dryer is performed under SPX supervision.

Before starting the assembly procedure, it is recommended to study the section "Layout of the plant" of the Operation and Maintenance Manual with reference to the plant layout drawing.

The plant is assembled/mounted as follows:

1. Place the unit horizontally by adjusting the adjustment screws.
2. Connect the compressed air for the nozzle atomization to the air pressure relief valve situated on the support construction under the electric panel.
3. Lead the exhaust air for the dryer to the atmosphere through a duct. This duct can be welded to the loose flange at the outlet of the exhaust fan. (This is the usual way of handling the exhaust air.)
4. Mount the rupture disc as described in section 5.1 "Rupture disc".
5. Fix the explosion duct (optional) by means of nuts.
6. Screw in the stainless M10 bolts loosely, thereby ensuring that the holes in the gasket are aligned with the holes in the flange of the explosion duct. Cross-tighten the screws with a torque wrench in order to obtain the optimum tightness ($M = 80 \text{ Nm}$).

In case feeding of the product will take place from the top of the plant – either in connection with co-current nozzle atomization or centrifugal atomization – the following mounting instructions must be followed:

1. Mount the feed tank on top of the drying chamber by turning it until it is placed horizontally. Dismount the attachment screw situated on the air distributor and fasten the bracket mounted on the feed tank. Subsequently, fasten the screw on the air distributor again.
2. Connect the flexible hose with couplings to the feed pipe and to the top of the drying chamber (for centrifugal and co-current atomization).

3. Connect the compressed air for the two-fluid nozzle atomization to the air reduction valve.

5.2.2 Installing a counter current two-fluid nozzle atomizer (optional)

A counter current two-fluid nozzle atomizer is installed as follows:

1. Place the circular cover in the air distributor and fasten it.
2. Check that the nozzle is mounted correctly on the nozzle bar.
3. Check that the gasket between the nozzle bar and the nozzle insert is intact and lies correctly.
4. Install the nozzle bar in the nozzle insert.
5. Fix the nozzle insert by means of a clamp ring.
6. Connect the feed line to the counter current nozzle atomizer.

5.2.3 Installing a centrifugal atomizer (optional)

Make sure that the centrifugal atomizer is assembled as described in the manual for the centrifugal atomizer.

Subsequently, the centrifugal atomizer is installed as follows:

1. Check that the gasket on which the atomizer is to rest is intact and positioned correctly.
2. Lower the insert cone for the centrifugal atomizer into the hole in the drying chamber top. Lower the centrifugal atomizer into the insert cone and connect the feed pipe to the vertical feed clamp connection of the atomizer.
3. Fix the fastening fittings and tighten them against the flange of the centrifugal atomizer - only in connection with explosion protection.
4. Insert the plug on the electric cable from the atomizer into the socket situated at the bottom of the instrument panel. Before starting up the atomizer, it must be inspected. Furthermore, it must be ensured that the atomizer wheel is placed correctly and tightened (please refer to the manual for the centrifugal atomizer).

- All filter elements are mounted correctly and are not blocked
- The main power supply is connected and the control panel is switched on. Subsequently, press the "Reset" button
- The direction of rotation of the fan is correct. If the fan does not start, check the line circuit breaker. If the direction of rotation is incorrect, the phases must be reversed
- The direction of rotation of the feed pump (optional) is correct. If the feed pump does not start, check the line circuit breaker. If the direction of rotation is incorrect, the phases must be reversed
- All instruments are mounted correctly and connected to the correct terminal strips in the control panel. (Please refer to the wiring diagram in the electrical documentation)

By measuring the airflow through the plant by means of a flowmeter the correctness of the air supply to the plant can be checked. Furthermore, the pressure drop across the cyclone indicates the airflow through the plant.

6 Operation

6.1 Before start-up

Check that:

- All ducts are assembled correctly
- All gaskets are mounted
- The chamber door is closed. The door gasket must be kept free from impurities and must not be damaged by hard objects
- The air filter is clean and positioned correctly
- The main power supply is connected and the control panel is switched on
- All instruments are mounted correctly and connected to the correct terminal strips in the control panel (refer to the wiring diagram in the electrical documentation)

While the plant is being heated, the compressed air for control air for the valves, sealing air etc. must be turned on.

Start the exhaust fan and check that the direction of rotation is correct. If the fan does not start, check the line circuit breaker. If the direction of rotation is incorrect, the phases must be reversed.

Start the feed pump (optional) and check the direction of rotation. If the feed pump does not start, check the line circuit breaker. If the direction of rotation is incorrect, the phases must be reversed.

The airflow through the plant must be adjusted if there is any doubt whether the correct amount is supplied. The minimum inlet airflow through the chamber must be 150 kg/h. This can be measured by means of a Pitot tube.

Depending on the atomizer, follow one of the procedures described in section 6.2.1 "Preparation for nozzle atomization" or in section 6.2.2 "Preparation for centrifugal atomization".

6.2.2 Preparation for centrifugal atomization



Note:

The procedures in the Operation and Maintenance Instructions for the centrifugal atomizer must be followed when the centrifugal atomizer is taken in use for the first time.

1. Inspect the centrifugal atomizer.
2. Make sure that the atomizer wheel is placed correctly and tightened (please refer to the Operation and Maintenance Instructions for the centrifugal atomizer).
3. Insert the plug on the electric cable from the atomizer into the socket situated at the bottom of the instrument panel.
4. Set the atomizer speed regulator at 30,000 rpm.
5. Start the atomizer cooling.
6. Start the centrifugal atomizer and regulate the atomizer steadily up to the required speed.

6.3 Start-up

The small scale spray dryer is started up as follows:

1. Fix a powder container where foreseen e.g. under the cyclone and under the bag filter. Open the butterfly valve(s)/ switch on the air valve(s).
2. Make sure that the air filter(s) is (are) clean and positioned correctly.
3. Set the desired pulse/pause time for the compressed air cleaning system for the bag filter (if any).
4. Close the drying chamber door and check the condition of the door gasket. The door gasket must be kept free from impurities and must not be damaged by hard objects. Check for leakage around the door (e.g. by smoke).
5. Assemble the feed line and close the valve(s) so that liquid cannot pass from the feed tank and the water tank (if any) to the atomizer. It is important that the drying chamber does not get wet.

The product is assumed to have a solids content of 40% by weight. Water content in the powder is required as approximately 3% H₂O per kg powder.

The mass flow can then be calculated by means of the following formula:

$$F = \frac{V \times T_p}{T_p - T_F} 1$$

F = product quantity, kg/h

V = water evaporation, kg/h

T_P = solids percentage in powder, %

T_F = solids percentage in feed, %

In the example, the mass flow of product corresponds to:

$$F = \frac{23 \times 97}{97 - 40} = 39 \frac{kg}{h}$$

In the example, the assumption has been made that the product can be dried at the temperatures and the solids content mentioned.

6.4.1 Changing powder container

When changing a powder container, the powder discharge valve in question must be closed and the clamp ring at the powder container must be dismantled. Hereafter the powder container in question can be removed.



Note:

The powder container situated under the cyclone should be replaced quickly, as it is only possible to accumulate a limited amount of powder in the cyclone bottom. Powder collected in excess of this quantity will be entrained in the discharge air and lost. Furthermore, there is a possibility of blockage of the cyclone outlet if the changeover takes too long.

6.5 Shut down

When the feed tank is almost empty of product, distilled water must be added to the feed line. This is done partly in order to clean the feed system, and partly in order to avoid overheating of the plant.



Warning:

Before the drying chamber door is opened it must be ensured that the centrifugal atomizer wheel (optional) has stopped rotating.

If the drying chamber door is not equipped with a switch, the door can only be opened by means of special tools. The drying chamber door may only be opened when the plant is stopped. It is the user's duty to ensure that the operators of the small scale spray dryer have received the appropriate training in opening of the drying chamber door.

During inspection of the plant, the main power must be cut off.

Subsequently, the feed system and the atomizer are removed for cleaning.

6.6 Cleaning of the small scale spray dryer

If the plant is to be cleaned with a combination of acid/alkaline solutions, it is recommended to use nitric acid maximum 2% and subsequently sodium hydroxide maximum 2%, with a maximum temperature of 85°C.



Important:

It is the user's responsibility to ensure that the correct cleaning agents are used.



Warning:

It is the user's responsibility to ensure that the personnel handle the cleaning agents correctly also as regards personal protection.

Cleaning agents containing chloride (max. 50 p.p.m.) must not be used for cleaning of the plant. Free chlorine must not be measurable.

Inspection doors, covers, flexible connections and CIP blanks must not be opened or dismantled during CIP cleaning.

If a leak is found, stop the CIP process and rinse with water before repairing the leak.

Acid, caustic and similar cleaning agents for CIP cleaning can cause serious damage through contact. Wear appropriate protection, especially eye protection. If CIP liquid gets into the eyes, rinse immediately with cold water and seek medical assistance.

Scrubber (optional)

1. Remove the top of the scrubber including the demister.
2. Open the bottom drain valve.
4. Rinse the scrubber with hot water.

Pipes and gaskets

1. Dismantle all pipes and assembling gaskets (situated between clamps, on the chamber door, powder containers etc.) and clean them before reinstallation.
2. After each part has been cleaned with hot water and dried, reassemble the plant.

Please refer to section 6.7 "Drying out after cleaning".

6.6.2 Cleaning of the plant with CIP unit

The plant is CIP cleaned as follows:



Important:

Please refer to the Functional Description – Operator's Instructions for the CIP unit for a complete description of the control of the CIP unit.

1. If the small scale spray dryer is equipped with a co-current atomizer, remove the centrifugal atomizer/two-fluid nozzle atomizer from the top of the drying chamber and place it in the service stand/the holder situated at the top of the drying chamber railing.
2. If the small scale spray dryer is equipped with a counter current atomizer, remove the two-fluid nozzle atomizer from the cone of the drying chamber and place it in the holder for the nozzle atomizer. Remember to insert a plug in the chamber cone.
3. Replace the co-current atomizer with the CIP lance and the adapter plate and connect them to the CIP supply. Dismount the drain plug situated in the bottom of the cone.
4. Connect all CIP connections and drain points according to the P&I diagram.

- Incorrect concentration of the cleaning agents

SPX Flow Technology Danmark A/S recommends that (local) manometers are installed in the CIP forward lines for control of the CIP line pressure.

Example of a cleaning procedure

The CIP cleaning procedure of the plant may contain some or all of the following steps:

Step	Liquid	Temperature	Cleaning time	Recirculation
Pre-rinse	Water	60-80 °C	5 min.	No
Water rinse	Water	60-80 °C	10 min.	Yes
Caustic rinse	1-2% NaOH	60-80 °C	10 min.	Yes
Intermediate rinse	Water	60-80 °C	5 min.	Yes
Acid rinse	1-2% HNO ₃	60-80 °C	5 min.	Yes
Final rinse	Water	20-80 °C	5 min.	Yes
Disinfection	Disinfectant	20-80 °C	5 min.	Yes



Note:

All values mentioned above are examples. The exact cleaning procedure must be determined individually for each product during plant commissioning and subsequent operation. The individual parameters are determined by cleaning tests recorded by the user and retrieved when working with the corresponding product.

7 Maintenance

The first section of this chapter contains the maintenance chart for the Anhydro small scale spray dryer. This chart contains a short description of the maintenance tasks and the different intervals at which the maintenance tasks must be performed to ensure safe and correct operation of the small scale spray dryer. The following section of the Maintenance chapter provides a detailed description of how to perform the different maintenance tasks.

7.1 Maintenance chart

Maintenance task	1 month	2 months	1 year	Specific
Check feed tube				Before and after every production - replace if necessary
Check all gaskets in drying chamber, cyclone, filters and condenser (if any)				After every production - replace if necessary
Check all valves				Every 3 months in accordance with the instructions from the valve suppliers
Check other equipment (e.g. feed pump, heater, fan, etc.)				According to the instructions from the supplier of the component in question
Check filter bags (if any)				Every six months or if the HEPA filter (if any) pressure drop raises
Replace filter bags (if any)				According to condition
Check bag filter cages (if any)				When replacing filter bags
Inspect compressed air tank on the bag filter (if any)				In compliance with local standards and rules
Check the inside of the scrubber (if any)				If the air leaving the scrubber is not clean

7.2 Description of maintenance tasks

This section provides a detailed description of how to perform the different maintenance tasks. Furthermore, a description of the maintenance tasks for the individual components can be found in the documentation for the components in the Operation and Maintenance Manual.



Note:

If spare parts other than the original spare parts recommended by SPX Flow Technology Danmark A/S are used, SPX Flow Technology Danmark A/S will not accept liability for any defects resulting from the use of the unoriginal parts.

7.2.1 Check feed tube

The feed tube must be checked and replaced if necessary before and after every production. For some applications a new tube is required before every production.

7.2.2 Check all gaskets in drying chamber, cyclone, filters and condenser (if any)

All gaskets in the drying chamber, the cyclone, the filters and the condenser (if any) must be checked and replaced if necessary after every production.

7.2.3 Check all valves

In order to ensure that the valves function correctly, they must be checked every three months in accordance with the instructions from the valve suppliers.

7.2.4 Check other equipment

Other equipment such as feed pump, heater, fan, etc. must be checked in accordance with the instructions from the supplier of the component in question.

7.2.5 Check filter bags (if any)

In order to ensure that the bag filter (if any) functions correctly during operation, it is necessary to check the filter bags every six months or if the HEPA filter (if any) pressure drop raises.



Warning:

The compressed air tank must be decompressed before the tap is opened.

7.2.14 Check HEPA filter (if any) and air intake filter(s)

Every two months, check that the HEPA filter (if any) and the air intake filter(s) function correctly and check the pressure drops across the filters during production. Please refer to the data sheet(s) from the HEPA filter and air intake filter(s) supplier(s).

7.2.15 Check condenser (if any)

In order to check the condenser (if any), it is necessary to dismount the top plate and carry out a visual inspection of the inside of the condenser in order to make sure that there are no holes or tears in the tubes inside the condenser. This check must be performed every two months.

Please do not hesitate to contact the Parts & Service Department of SPX Flow Technology Danmark A/S concerning further questions about maintenance of the condenser.

7.2.16 Check venting channel

Every two months the venting channel must be checked visually for any obstacles (objects) reducing its area and eventually efficiency in order to ensure efficient venting from the plant. Furthermore, the venting channel must be checked visually for cracks, holes, wear and tear.

7.2.17 Check centrifugal atomizer wheel (if any)

Every two months the centrifugal atomizer wheel must be checked for cracks and any indications of wear.

7.2.18 Check atomizer lance and nozzle

The atomizer lance and the nozzles used must be inspected for wear, crevices and cracks every two months.

7.2.19 Check rupture discs

The rupture discs must be checked visually for cracks, holes, wear and tear once a year and if a leak is present in the system

8 Troubleshooting

This chapter provides a description of different problems that might arise during operation of the unit/plant and how these problems can be remedied.

8.1 Fluidization

Problem: High outlet temperature.

Cause:

Outlet temperature alarm.

Remedy:

Check that:

- The feed pump (optional) is running
- The centrifugal atomizer is running (optional)
- The air supplied to the two-fluid nozzle atomizer is sufficient
- The nozzle is not blocked

Problem: Low capacity.

Cause:

Less powder than calculated.

Remedy:

Check:

- That the fan is running in the correct direction
- The pressure drop across the cyclone
- The pressure drop across the HEPA filter (optional)
- The pressure drop across the bag filter (optional)
- That the valves on the air loop are open

9 Spare parts

SPX FLOW is represented in most parts of the world which, among other things, makes the ordering of spare parts easy. In order to find the Anhydro brand representative closest to you, please refer to our website www.spxflow.com where the different addresses of the SPX FLOW companies and Anhydro brand representatives are stated.

When ordering spare parts, please contact the Parts & Service Department of SPX Flow Technology Danmark A/S (address stated below) or the Anhydro brand representative closest to you and state the following information:

Project No.: This number consists of 3 letters and up to 4 figures, e.g. GER0123 and is stated on the front page of the Operation and Maintenance Manual.

The Pos. No./ PI Code of the part in question: This number is found in the first column of the Motor List, Valve List, Instrument List or Spare Parts List in the Operation and Maintenance Manual.

The Position/Description of the part in question: This description is found in the third column of the Motor List, Valve List, Instrument List or Spare Parts List in the Operation and Maintenance Manual.

If known, the number of the drawing in which the part in question is illustrated.

If you need further information or assistance concerning the ordering of spare parts, please do not hesitate to contact the Parts & Service Department of SPX Flow Technology Danmark A/S at the following address:

SPX Flow Technology Danmark A/S
Parts & Service Department
Oestmarken 7
2860 Soeborg
Denmark
Phone: +45 70 278 222
Fax: +45 70 278 228
E-mail: ft.dk.soeborg.ps@spxflow.com

10 Declarations

10.1 Declaration of conformity

Machinery Directive (2006/42/EC) Annex II, Part 1, Section A

We

**SPX Flow Technology Danmark A/S
Oestmarken 7
2860 Soeborg
Denmark**

herewith declare that the below machinery

Anhydro small scale spray dryer

Type: MS150

ID No.: 53014

Year : 2017

Project No.: HOL1134

Customer: Duplaco B.V.

- is in conformity with the provisions of the Machinery Directive (2006/42/EC), as amended, and with national implementing legislation;
- is in conformity with the provisions of the following other EC directives:

2014/30/EC

Further, we declare that the following (parts of) harmonized standards have been applied:

EN ISO 12100:2010, EN 60204-1

Soeborg:

31-MAY 2017

(Place and date of issue)

(Jan Olsen)

(Name and signature or similar identification of authorized person)

10.2 Declaration of compliance for food contact materials

We

**SPX Flow Technology Danmark A/S
Oestmarken 7
2860 Soeborg
Denmark**

herewith declare that the equipment

Anhydro small scale spray dryer

Type: MS150

ID No.: 53014

Year : 2017

Project No.: HOL1134

Customer: Duplaco B.V.

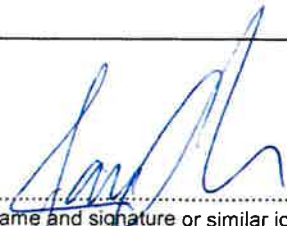
- is in conformity with the provisions of the EC regulation No. 1935/2004 on materials and articles intended to come into contact with food;
- is manufactured in conformity with the provisions of EC regulation No. 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food

The intended use and the limitations of use are described in the Operation and Maintenance Manual.

Soeborg

31-MAY 2017
(Place and date of issue)

(Jan Olsen)


(Name and signature or similar identification of authorized person)