Cleaning recommendation for TranspoNet pneumatic tube systems and components

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1. Introduction

1.1 Regular operation of a pneumatic tube systems (PTS)

PTS are an integral part of modern hospitals. Clinical staff use them intensively to perform core tasks, so to ensure daily operation it is essential to comply with environmental cleanliness standards. The PTS should be cleaned before first operation using the appropriate cleaning procedures (see section 2). During regular operation, periodic cleaning, care and maintenance should be performed according to hospital protocol. Regular maintenance helps to detect and remove contaminants early.

1.2 Possible contamination in PTS

PTS can be contaminated by:
— Rigorous daily use
— Improper installation and commissioning
— Lack of maintenance
— Insufficient maintenance
— Regular system wear

The PTS, including the pipes, should be cleaned regularly (recommendation: once a month for the first six months) to prevent dirt and dust from accumulating (see section 1.2.1).

Systems can also become soiled by transporting prohibited materials (e.g. liquids in glass containers such as drinking bottles). In addition, contamination can occur either intentionally or unintentionally when dirty carriers are placed into or left in the system.

1.2.1 Dust

Dust particles are the most common contaminant in PTS. These particles can be debris from installation work (e.g. lime) and common dust. This type of contamination can be reduced by various methods (see sections 3.5 and 4.).

1.2.2 Liquids (e.g. condensation/water)

System piping can extend for long distances with fluctuating air temperatures and humidity levels. These installations, combined with unfavorable weather conditions, can promote condensation.

Condensation is not generally problematic as it can be prevented by tube heat tracing systems. If water is absorbed by carriers, hospital air conditioning systems can mitigate humidity.

1.2.3 Contamination through incorrect use

The most complex impurities are those that are introduced into the system by users who either consciously or unconsciously use carriers that are not sufficiently cleaned or disinfected. The hospital is responsible for implementing sufficient precautions to prevent users from incorrectly using the system. Technical precautions, such as using industrial dishwashers to disinfect carriers, can reduce these contaminants when used appropriately (see section 3).

1.3 Possible risks related to PTS

For decades, PTS have been used in the healthcare industry to transport small payloads, including drugs, laboratory samples, consumables and documents, as well as sensitive goods such as vaccines and blood products.

As a PTS manufacturer, we recommend that hospitals establish careful cleaning processes to prevent any kind of contamination by their PTS. The possible contamination caused by incorrect use as described in section 1.2 (e.g. due to lack of cleaning) may have adverse effects on the hospital employees, patients or visitors.

In addition to dust contamination, bacterial contamination is also possible. Therefore, the hospital should conduct regular inspections of the PTS working environment to avoid those risks.

Another hospital responsibility is to make sure that the pneumatic delivery system and its components (e.g. carriers) are in good condition. Here, too, regular, documented inspections are recommended.

Spilled fluids, including clinical samples, blood or medication, that leak into the carrier are a further cause of contamination in a PTS.
The risk of leakage and its effects on the hospital environment can be reduced by using suitable carriers and carrier inserts and providing smooth delivery.

Transit time is of great importance when transporting critical contents. PTS are designed for fast delivery; however, not all suppliers' systems are designed for heavy volumes of traffic. Users may need to pay attention when sending critical and/or time-critical items to ensure that there are no system delays due to traffic, spills, etc.

A modern PTS is able to monitor every transaction and track the carriers. In addition, modern PTS pipes, transfer units and receiving stations transport carriers on a soft, air-cushion that more safely transports carriers and their contents.

In comparison to primary sources of infection such as the skin, mucous membranes and patient wounds, there is minimal research on non-living surfaces as sources of infection. Hospitals should consider these during a risk assessment, depending on local conditions and requirements.

The hospital infection control personnel and PTS operators should coordinate to discuss the potential risk of other contaminations in a PTS.

The activities listed in section 2 regarding cleaning (and further preventive measures such as regular cleaning and disinfection) should be defined in direct dialogue with the hospital and executed under supervision by the hospital staff.

2. Recommendations for cleaning and disinfecting PTS and components

2.1 Leak test and repackaging

Our recommendation to all PTS users is to check the integrity and leak resistance of the sample and medication containers used before transporting them in PTS.

NOTE: These tests should be carried out before initial operation of PTS to ensure the general adequacy of the sample containers used.

Accordingly, the hospital should only provide appropriate containers, so that users cannot select unsuitable containers for critical transport operations. Fragile and/or hazardous materials should be repacked in suitable security containers before transport. The LeakResistant carriers or SafeSeal carriers also help to prevent leakage.

When the PTS is ready for operation, follow these steps:

1. Fill the test transport container three-quarters full of water and close the lid.
2. Place the container in a clear plastic bag (or other sealed bag).
3. Place the sealed bag with the test container into a carrier.
4. Select a distant station as the receiving station for the test container.
5. Send the carrier with the "water sample" through the PTS to the selected station. Coordinate with the user at the receiving station to ensure they immediately return the carrier to its starting point.
6. Upon return, check the container and the plastic bag for leaks.
7. Repeat steps 1 through 6 several times for each sample container to be used in the PTS. Use a new primary container each time, and simulate normal use of the system as exactly as possible.

If the system is not yet operational, perform steps 1 and 2, and then follow the instructions below:

— Manually rotate the sealed bag containing the test container and check for leaks.

— If the container leaks, replace it with an alternative container.

2.2 Sample packaging

Because blood and body fluids are potentially infectious and hazardous materials, we recommend using suitable containment materials to protect and ensure specimen integrity during transport.

WARNING: All persons handling samples must wear the appropriate personal protective equipment (PPE) as defined in the general safety regulations.

Follow the steps below for a protected transport:

1. Place the primary containers with samples in a suitable bag.
2. Place the bag, along with any necessary request forms, into the carrier.
3. Send the carrier to the appropriate receiving station.

2.3 Limitating the spread of a spill in the system (leakage outside the carrier)

The following recommendations for action correspond to advice given to the person responsible for operation of the respective PTS:

1. If a leak from a carrier is discovered, it is recommended to immediately stop sending carriers from the station where the contamination was first noticed.
2. If necessary, notify the Engineering or Facilities department and ask them to initiate a system cleaning.
   A temporary partial or complete shutdown of the system can also be considered with the operators.
3. If necessary, an emergency shutdown should be initiated to isolate the leakage to the fewest possible number of pipes.
4. Notify the responsible department (Engineering or Facilities) and indicate the following:
   — Receiving station number
   — Transmitting station number (if known)
   — Type of leakage (i.e. sample type and presumed quantity)
   — Time the contaminated carrier arrived (or when first discovered)
   — Number of contaminated carriers received
5. If necessary, remove the contents of the carrier using suitable protective equipment (PPE). If the contents of the carrier are unknown or are considered dangerous, place the carrier in a biohazard containment receptacle.
6. When system decontamination is complete, have the department responsible for decontamination restart the PTS.
7. Create an incident report according to the hospital's procedures.

2.4 Cleaning and disinfecting carriers

Germs and pathogens can survive on surfaces for long periods of time. This includes carrier surfaces that potentially spread them throughout the hospital. Our recommendation to healthcare facilities is therefore to develop carrier cleaning and disinfection procedures.

2.4.1 Definitions and objectives

Cleaning: "Cleaning" is the process of removing contaminants (e.g. dust, chemical substances, micro-organisms and organic substances) using water with cleaning-intensive additives (e.g. detergents or enzymatic products), whereby destruction/inactivation of micro-organisms does not usually occur.

Disinfection: "Disinfection" is a process in which the number of viable micro-organisms is reduced by destruction/inactivation. The aim of disinfection is the reduction of germs. With regard to the frequency and extent of disinfection, a classification is made as follows:

— **Routine disinfection:** regular disinfection with the aim of limiting the spread of pathogens.

— **Targeted disinfection**: measures that should be taken in case of visible contamination, final disinfection, outbreak situations and the occurrence of specific pathogens.

If cleaning and disinfection are carried out in one operation, this shall be considered as disinfectant cleaning.

2.4.2 Substance groups

The following list of active substances can be used to select a suitable solution.

NOTE: Only a few preparations contain only one active ingredient, most support a combination of active ingredients to achieve a broader effect.

Alcohols: Alcohols are preferably used for hand disinfection and skin antiseptics. This group of active ingredients is characterized by the following advantageous properties: easy application, fast onset of action and favorable toxicological characteristics. Furthermore, they have a broad spectrum of effectiveness.

Aldehydes / Aldehyde-releasing substances: Aldehydes are among the substances with the broadest spectrum of effectiveness. Due to their safety and material compatibility profiles, these disinfectants are used for surface, instrument, laundry and room disinfection.

Oxidizing substances: Peroxycarboxylic acid is the main oxidizing substance used in hospitals. Areas of application are instrument, surface and laundry disinfection - the latter because of the favourable environmental compatibility profile.

The selection of suitable active substance groups must be determined by the hospital with the involvement of suitable experts.

2.4.3 Manual disinfecting cleaning process for carriers

1. The surfaces of the carrier (inside and outside) should be thoroughly cleaned to remove any contaminants before disinfection.
2. Using light pressure, wipe the carrier with a sufficient amount of the appropriate disinfectant.
3. Let the carrier dry.

Be sure to follow the manufacturer's instructions for the disinfectant liquids used with regard to the following points:

— Exact measurement

— Concentration and exposure-time ratio

— Disposal

— Directions for use

— Storage

2.4.4 Cleaning with industrial dishwashers

1. Place the open carrier in the machine and position it so that water can reach all surfaces.
2. Add detergents and/or disinfectants if necessary.
3. Select a suitable cleaning cycle for medium temperatures (< 55°C).
4. Let the carrier dry.

Always follow the manufacturer's instructions for detergents and/or disinfectants that are approved for use in industrial dishwashers.

WARNING: All persons handling samples must wear the appropriate personal protective equipment (PPE) as defined in the general safety regulations. The hospital is responsible for preparing, providing training and ensuring compliance.

3. Disinfectants and cleaning substances for TranspoNet carriers

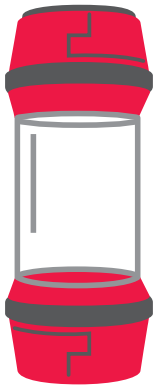
In this section we describe the suitable cleaning agents for cleaning TranspoNet carriers by hand or with an industrial dishwasher. Our recommendation is to use industrial dishwashers to clean carriers. The TranspoNet carriers have been tested with different active substances to determine those that do not damage the carrier materials.As a result of the study we recommend the use of the following active substances.

NOTE: Always follow the manufacturer's instructions.

3.1 TranspoNet Standard carrier

The standard carrier is available in different diameters and lengths. The body of the carrier is transparent for an initial visual check of the integrity of the goods being transported.

Tests have shown that the standard carrier can be treated with peroxide agents and aldehydes.



Substances

- Aldehydes
- Oxidizing agents (peroxide compounds)

3.2 TranspoNet LeakResistant carrier

The leak-resistant carrier is available with a diameter of 160 mm. Its special locking mechanism provides leak resistance and safe transport.

Tests have shown that the LeakResistant carrier can be treated with alcohols, peroxide compounds and aldehydes.

Substances

- Alcohols
- Aldehydes
- Oxidizing agents (peroxide compounds)

3.3 TranspoNet SmartOpen carrier

The TranspoNet SmartOpen carrier comes in diameters of 110 and 160 mm and is used for automated loading and unloading equipment.

According to test results, the SmartOpen carrier can be cleaned with aldehydes and alcohols.

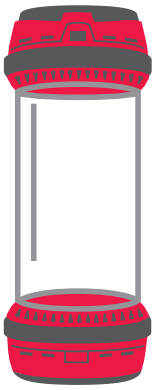
Substances

- Alcohols
- Aldehydes

3.4 TranspoNet SafeSeal carrier

The TranspoNet SafeSeal carrier is available with a diameter of 160 mm. The body of the carrier is transparent for an initial visual check of the integrity of the transported goods.

Tests have shown that the SafeSeal carrier can be cleaned with quaternary substances, peroxide compounds and aldehydes.



Substances

- Aldehydes
- Quaternary compounds
- Oxidizing agents (peroxide compounds)

3.5 TranspoNet Cleaning carrier

The TranspoNet cleaning carrier is available with a diameter of 110 and 160 mm. With the help of this carrier and the appropriate cleaning substance, it is possible to clean the inside of the tube.

The sponges of the cleaning carrier can be easily replaced after use.

Substances

- Aldehydes
- Quaternary compounds
- Oxidizing agents (peroxide compounds)

4. Summary

Rigorous, daily use of the PTS by clinical personnel necessitates regular cleaning of PTS and their components. Dust and spills are the main sources of contamination. Improper use, such as inappropriate transport speeds when moving highly sensitive goods, further increases the risk of contamination.

It is recommended to use leak-resistant carriers and develop procedures for disinfecting carriers and cleaning the tube system.
By using suitable cleaning agents it can be ensured that regular cleaning does not negatively affect the PTS components.