SYNERGY
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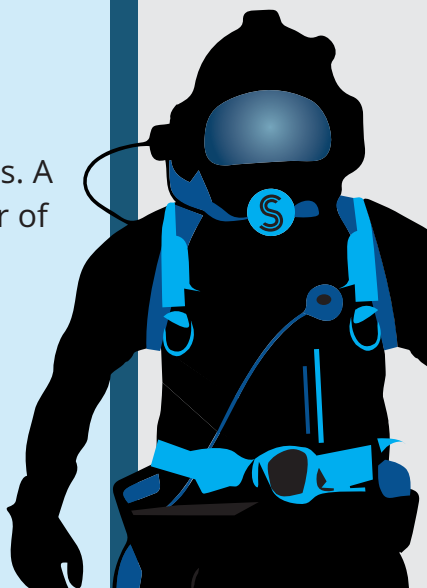
ISO 45001:2018 OHSMS

BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

- 25L Biological BIOX Ultrasonic Cleaner Solution - For breathing apparatus, scuba equipment and life support systems
- A non-toxic, non-hazardous, non-flammable fluid - Tested by Finnish Research Centre, Thames Water and the National Water Council
- Approved by Lloyds Register of shipping for oxygenated breathing systems, and has N.A.T.O. Codification numbers for cleaning M.O.D. Diving and breathing equipment
- This fluid is NOT concentrated simply fill the Ultrasonic tank with this fluid only
- Safe to use on painted, chrome and textile items, as well as iron, steel, copper, brass, aluminium
- Please read the datasheet carefully before use
- Always test before use on new applications

A specialist formulation for removing grease, oil and contaminants from oxygenated breathing apparatus, scuba diving gear, and life support systems. A non-toxic, non-hazardous, non-flammable fluid. Approved by Lloyds Register of shipping for oxygenated breathing systems, and has N.A.T.O. Codification numbers for cleaning M.O.D. Diving and breathing equipment.



BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

1) Identification of the Substance / Preparation and Company / Undertaking :

Product Name: Biox Liquid / Biox 02 Liquid

Manufacture: Biox Ltd. The Granary, Yeo Lane, North Tawton,
Devon. EX20 2DD. United Kingdom
Tel: 0044 (0) 1837880135 Email : bioxint@hotmail.com

2) Composition / Information on Ingredients:

Composition Comments Contains no ingredients classified as hazardous under current legislation.

3) Hazards Identification:

Non-classified. Not regarded as a health or environmental hazard under current legislation.

4) First Aid Measures:

Inhalation: Non Hazardous.
Ingestion: Drink plenty of water.
Skin contact: Rinse affected area with water.
Eye contact: Rinse thoroughly with water.

5) Fire Fighting Measures:

Extinguishing Media: Non-Flammable. Use extinguishing media appropriate for surrounding fire.

6) Accidental Release Measures:

Spill Cleanup Method: Stop leak if possible without risk. Sluice to waste using plenty of cold water through normal sewerage system.

7) Handling and Storage:

Store conventionally in closed containers, keep in original container. Do not store below 4 C.

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8) Exposure Controls / Personal Protection:

Ingredient Comments : For prolonged or repeated contact. protection of the skin may be necessary.

Protective Equipment:

Ventilation: Provide adequate general and local ventilation.
Eye Protection: Wear approved chemical safety goggles where eye exposure is reasonably probable.

Other Protection: Wear appropriate clothing to prevent any long term skin exposure.

9) Physical & Chemical Properties:

Appearance: Almost neutral liquid.
Colour: Yellowish.
Odour / Taste: Slight Organic Odour
Chemical Properties: Aqueous solution pH 2.2

10) Stability & Reactivity:

Stability: Stable under normal conditions.
Conditions To Avoid: May react strongly with Sodium Nitrite (NaNO2).
It is however possible to use Sodium Nitrite in small quantities in rinsing water.

11) Toxicological information:

Health Warnings: Non Toxic.
Inhalation: Non Hazardous / Low VOC.
Eyes: May cause transient superficial eye irritation.
Ingestion: Ingestion Non Hazardous.
Skin: Prolonged or repeated contact may lead to drying of skin.
Route Of Entry: Ingestion, Inhalation, Skin and/or eye contact.

12) Ecological information:

Ecological information: The surfactants conform to EC biodegradability Legislation. Not regarded as dangerous to the environment.

13) Disposal considerations:

Disposal Methods: Observe rules of local authority. Thames Water approval for sewer disposal. Add Sodium Bicarbonate, NaHC03 (Baking Soda. 6% raises pH to 5.5, 9% raises pH to 7.0)

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1 PURE OXYGEN OR OXYGEN RICH BUILDING SYSTEMS

a) Pure oxygen is a colourless, odourless and tasteless gas. Under pressure oxygen may cause various materials to spontaneously ignite causing fire until either the oxygen or the material is exhausted. Therefore it is of paramount importance that the components for use with pure oxygen or oxygen rich gas are thoroughly cleaned to remove all traces of oil or grease contamination obtained during manufacture.

b) It is particularly important that all material used with pure oxygen or oxygen rich mixtures (i.e. greater than 21% oxygen content) are fully tested for compatibility at the required working pressure and that documentary evidence, in the form of Certificate of Conformity, are produced for inspection.

c) All components in the breathing-gas path of a system, are required to be oxygen-cleaned in accordance with the procedures detailed in this document.

2 COMPRESSED AIR BREATHING SYSTEMS

a) Many of the procedures set out in this document are suitable for applying to compressed-air breathing systems and any component in the breathing-gas path is to be considered as a candidate for oxygen-cleaning, as described in the procedures detailed in this document. Particular consideration is to be given to the following components:

i) Valves and Regulators.

ii) Breathing-gas cylinders.

iii) Manifolds.

iv) Breathing-gas pipe work and hoses.

3 CONTROLLED AREA

a) A controlled area is defined as any working space that is not a clean room, as referenced where cleanliness control procedures create an environment free of oil, grease and dust.

4 SAFETY

a) It is essential that both management and operators comply strictly with the Health and Safety at Work Act, 1974, and the Factories Act of 1961. Particular attention is to be paid to the COSHH Regulations 1989.

b) **Hazard and data sheets must be obtained for substances recommended in this document with particular attention to the following:**

c) Biox BioDeg A highly concentrated, nearly neutral, aqueous degreaser. It is a preparation of low order toxicity containing non-ionic surfactants. The usual cleaning solution and distilled water. Important safety aspects are:

i) The concentrate dissolves the natural oils of the skin therefore avoid all contact.

ii) Gloves and other protective clothing are recommended to be worn.

iii) If any external contact is made, flush the affected area with copious quantities of water.

iv) If any internal contact is made, see BioDeg data sheet and seek medical advice

d) High Purity Nitrogen (N2) (White Spot - filter to 10 microns). This product is non-toxic and non-flammable gas and when used in large concentrations, will deplete the oxygen content and cylinder assemblies with areas keep an oxygen gas analyser within the vicinity. Therefore, when venting high pressure systems nitrogen, ensure that adequate ventilation is available. In enclosed areas it is to be used to monitor the oxygen level, if the level falls to below 17%, all nitrogen venting is to **CEASE** immediately.

5 PRE-CLEANING

a) Prior to oxygen cleaning breathing gas components and hoses using solution, excessively soiled metallic items are to be pre-cleaned using Biox Biodeg liquid. This is a biological cleaning agent which, when used diluted, will remove heavy grease and post manufacturing contaminates. (Refer to Sect 6.)

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6 PRE-CLEANING COMPONENTS USING BIOX 02 LIQUID AND/OR BIODEG WITH ULTRA SONIC CLEANING

CAUTION
DAMAGE TO EQUIPMENT. The cleaning units are controlled by an 'on-pulse timer and in sequence should not be interrupted once the program has commenced. To this effect, operators are to ensure that:

a) When a program has commenced, no attempt is made to change or interrupt that program.

b) If there is a requirement for the program to be reset or altered, the selector switch is first set to OFF and then the sequence restarted.

c) Using an ultrasonic cleaner, pre-clean components as follows:

i) Remove any loose particles of paint from .

ii) Fill the ultrasonic bath tank with Biox 02 liquid or Biodeg for pre wash, dilute depending upon degree of contamination.

iii) Place components on the suspended screen in the ultrasonic bath tank and ensure they are completely immersed in the Biox 02 liquid or Biodeg as appropriate.

Place small components, that may fall through the screen, in a fine wire mesh tray or container first, and ensure they are completely immersed in the liquid.

iv) With Biox 02 Liquid in Tank, set the 3-position selector switch to WASH, this activates the heater pads. When the Biox 02 liquid reaches a temperature of between 55C and 70C, the thermostat will operate to activate the 6 min timer and ultrasonic cleaning cycle.

v) On completion of the cleaning cycle, slowly remove the screen from the liquid and allow to drain.

NOTE
Biox 02 liquid or Biodeg may be used repeatedly, therefore it is not necessary to dispose of the bath tank contents after use.

vi) Drain the Biox 02 liquid from the bath tank into a suitable container, refill with clean fresh water and replace the screen complete with components.

vii) Set the 3-position selector switch to Rinse, thus activating the 6 mm rinse cycle.

viii) On completion of the rinse cycle, remove the screen and allow the components to drain. Carry out the oxygen cleaning procedures to follow in section 8 onwards.

d) When an ultrasonic cleaner is not available, immerse components in a suitable container filled with Biox 02 liquid or Biodeg for pre soak. Empty container and soak components in Biox 02 for a period of approximately one hour. After which, remove and rinse in clean fresh water. On completion, carry out the oxygen cleaning procedure.

7 PRE-CLEANING HOSES USING BIOX 02 LIQUID

Pre-clean hoses as follows;

a) Remove any loose particles.

b) Heat Biox 02 liquid to 50oC.

c) Fill hose and leave to soak for approximately one hour.

d) Drain off liquid, flush through with clean fresh water and allow to drain.

e) On completion, carry out the oxygen cleaning procedures from section 10 onwards.

8 CLEANING

Cleaning non-metallic components using Biox 02 Liquid and Biox Biodeg.

a) Cleaning operations must only be carried out in controlled areas as defined in Section 3. The recommended cleaning procedures are detailed as follows:

i) Ensure that any necessary pre-cleaning has been carried out with Biox Biodeg or Biox 02 as detailed in Sections 6c or 6d.

ii) Immerse all the plastic or rubber components in to solution of Biox 02 Liquid neat and agitate until all oil, grease and particulate contamination have been removed. This solution is to be used exclusively for plastic and rubber components and is to be changed at regular intervals to maintain its cleaning action.

iii) When the components are clean, remove them from the solution and place on the suspended screen in the ultrasonic bath tank, which should be filled with clean distilled water.

Place small components, that may fall through the screen, in a fine wire mesh tray or container. Ensure that all components are completely immersed in the water.

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iv) Set the 3-position selector to RINSE, activating the 6 minute rinse cycle of the unheated water.

v) The clean components are to be inspected as described in Section 21. If a further 6 minute cycle is required, set the selector to OFF and then back to RINSE.

vi) Dry all the components thoroughly in the controlled area, either by natural evaporation or by use of the RS heat gun.

vii) All parts that are not assembled immediately or installed into the system are to be identified and packed as detailed in Sections 22, 23 and 24.

9 ULTRASONIC CLEANING METALLIC COMPONENTS USING BIOX 02 LIQUID.

a) Proceed as follows:

i) Ensure that any necessary pre-cleaning has been carried out as detailed in Sections 6c and 6d.

ii) Place the component on the suspended screen in the ultrasonic bath ensuring that they are totally immersed in the Biox 02 Liquid either neat or 4 parts water :1 part Biox 02. Place small components that may fall through the screen, in a fine wire mesh tray or container, and ensure that they are completely immersed in the solution.

iii) Set the 3-position selector to WASH, this activates the heater pads. When the solution reaches 50 C the thermostat will operate to activate the 6 minute timer and ultrasonic cleaning cycle.

iv) On completion of the cleaning cycle, slowly remove the screen from the solution and allow the liquid to evaporate.

v) Drain the contaminated solution from the bath tank into a suitable container ready for disposal.

vi) Refill the bath tank with clean distilled water and replace the screen complete with components.

vii) Set the 3-position selector to RINSE, activating the 6 minute rinse cycle of unheated water.

viii) The cleaned components are to be inspected as described in Section 21. If a further 6 minute rinse cycle is required, set the selector to OFF and then back to RINSE.

ix) Dry all components thoroughly in the Controlled Area, either by natural evaporation or by use of the RS heat gun.

x) All parts that are not immediately assembled and installed into the system should be identified and packed as described in Sections 22, 23 and 24.

10 CLEANING HOSES FITTED WITH METALLIC AND NON-METALLIC FITTINGS.

a) The procedure for cleaning hoses with metallic or non-metallic fittings, is detailed as follows:

i) Ensure that any necessary pre-cleaning has been carried out as detailed in Section 7.

ii) Set up a loop system of hoses using adapters between various hose lengths. Immerse in Biox 02 liquid at approximately 50^{0}C ready to clean the hoses.

iii) Flush the hose loop at least three times with Biox 02 (4 parts water :1 part Biox 02) solution, replacing the soiled solution between each flushing cycle. Determine an acceptable flow rate of litres per minute by multiplying the internal hose diameter (mm) by a factor of 0.3.

iv) Drain the Biox 02 solution and rinse the hose loop with clean fresh water, heated to approximately 50^{0}C and at the flow rate calculated at Step iii). Repeat this procedure, using new flushing water each time, at least five times or until the water ceases to foam.

v) The cleaned components are to be inspected as detailed in Section 21.

vi) Remove the hose loop from the cleansing loop and suspend from suitable securing points for a minimum period of 24 hours to allow the hoses to drain.

vii) On completion of the draining period, connect the hose loop to a supply of high purity nitrogen heated to 50C. Adjust the nitrogen flow rate to allow a minimum 1/2 bar gauge pressure gas flow through the hose. Continue gas purging for 20 minutes and on completion seal each end of the hose using oxygen-clean metallic plugs.

viii) Cleaned hoses that are not immediately assembled and installed into the system should be identified and packed as detailed in Sections 22, 23 and 24.

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11 FLEXIBLE METALLIC HOSES

a) The procedure for cleaning flexible metallic hoses is detailed as follows:

i) Ensure that any necessary pre-cleaning has been carried out as detailed in Section 7.

ii) Remove all non-metallic items such as seals etc. from the hose.

iii) Externally clean the hose assembly using diluted warm Biodeg at 12.5% dilution rate.

iv) Place the hose in an oven heated to a temperature of between 70C. and 80C. for a minimum period of 30 mins.

NOTE
The time duration is dependent upon the temperature of the fluid, hose diameter and hose length.

v) Depending on the length of hose, internally clean the hose using Biox 02 Liquid (4 parts water :1 part Biox 02) solution supplied under pressure, allowing a period of 15 minutes to soak.

vi) Inspect a sample of discarded solution from the hose for contamination as described in Section 21.

vii) Repeat Step v) until the sample of discarded solution is seen to be uncontaminated. Biox 02 Liquid is then blown from the pipes and back into the tank using clean, dry air. Potable water is then pumped through the pipes to remove any remaining droplets of Biox 02 Liquid solution. Flushing out of the system in this way is continued until the difference in PH value is less than 1 PH..

viii) Place the hose in an oven heated to a temperature of between 70C. and 80C. for a minimum period of 30 minutes to allow any liquid to evaporate

NOTE
The time duration is dependent upon the temperature of the of the solution, hose diameter and hose length.

ix) Turn the oven off. Leave the hose in the oven until it has cooled to the ambient temperature.

x) Option - (if stated on the drawing) purge and fill with white spot nitrogen.

xi) Cleaned hoses that are not immediately assembled and installed into the system should be identified and packed as described in Sections 22, 23 and 24.

Note: For more detail cleaning procedures pleases see the Mara Data Pack on Hyper baric cleaning of pipe work.

12 CLEANING BREATHING GAS STORAGE CYLINDER VALVES

a) Proceed as follows:

i) Remove any non-metallic items, such as seals etc.

ii) Remove any loose particulate and thread tape by gently cleaning with a wire brush.

iii) Strip down the valve to its component parts and inspect for wear and damage. Discard worn or damaged items, and replace with new.

iv) Pre-clean component parts as described in **Section 6c**.

v) Clean all component parts as described in **Section 9**.

vi) Inspect the cleaned components as described in **Section 21.**

vii) Reassemble the valve assembly in a Clean Room using oxygen-clean tools to ensure the components are free from contamination.

viii) All items that are not immediately assembled and installed into the system, should be identified and packed as detailed in Sections 22, 23 and 24.

NOTE
All replacement components used are to be cleaned in accordance with the appropriate paragraphs prior to assembly, or certified oxygen-clean.

13 CLEANING BREATHING GAS STORAGE CYLINDERS

CAUTION EQUIPMENT DAMAGE.
The temperature of the steam is not to exceed 150°C. If this is exceeded mechanical damage will be experienced in aluminium alloy cylinders (BS 5430 Part 3, Para 4.2.3 (1990) refers).

a) Proceed as follows:

i) Remove the valve assembly.

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The time duration is dependent upon the temperature of the of the solution, hose diameter and hose length.

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Note: For more detail cleaning procedures pleases see the Mara Data Pack on Hyper baric cleaning of pipe work.

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ii) Remove any loose particulate and thread tape by gently cleaning with a wire brush.

iii) Strip down the valve to its component parts and inspect for wear and damage. Discard worn or damaged items, and replace with new.

iv) Pre-clean component parts as described in **Section 6c**.

v) Clean all component parts as described in **Section 9**.

vi) Inspect the cleaned components as described in **Section 21.**

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The temperature of the steam is not to exceed 150°C. If this is exceeded mechanical damage will be experienced in aluminium alloy cylinders (BS 5430 Part 3, Para 4.2.3 (1990) refers).

a) Proceed as follows:

i) Remove the valve assembly.

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ii) Carefully remove any grease deposits from around the neck and thread area.

iii) Using an oxygen-clean endoscope, inspect the inside of the cylinder for any signs of internal corrosion, blemish or foreign material.

iv) All internal blemishes or corrosion to be removed by bead blasting. Once inspected fill with warm Biox 02 Liquid ideally neat (but could be diluted if necessary) for 15-20 minutes depending upon contamination.

v) After soaking empty Biox 02, for reuse or dispose off as necessary. Place the cylinder vertically (neck down) onto a steam cleaning manifold.

vi) Using a steam generator capable of producing a continuous quantity of clean, oil free, saturated steam, of 150 Deg. C. at a pressure of not less than 2 bar, circulate the steam for a period of:

a. 5 minutes for cylinders of 2 litre or less capacity.

b. 10 minutes for cylinders over 2 litre capacity.

vii) On completion of steam cleaning remove the cylinder from the manifold and allow it to drain for ten minutes to dry. Purge the cylinder with white spot nitrogen at a pressure of 1 bar, for a minimum period of 5 mins depending on the cylinder capacity.

viii) The cylinder must be either, immediately re-valved, or capped with an oxygen-clean cap, and the cylinder marked or labeled 'Oxygen-Clean'.

14 INSPECTING BREATHING GAS STORAGE CYLINDERS

a) Owing to the difficulty of inspecting storage cylinders on completion of cleaning, the cleaning process, if followed correctly, will ensure an oxygen clean cylinder. Inspection is limited to that detailed in Section 21.

15 VALVE REFITTING

a) NOTES

i) Only oxygen clean valves and 0-rings are to be used.
ii) Only minimum quantities of high pressure (205 bar) oxygen compatible grease are to be used, e.g. 'FOMBLIN' Type YNX.
iii) Only PTFE tape is to be used on taper threads. (Beldam Crossley Ltd, Type S.3313.)
iv) Tape must not start closer than two threads from the valve open end.
v) Use only 1½ turns of tape.
vi) Do not touch the threads unnecessarily.

b) Proceed as follows:

i) Refit the valve and tighten to the specified torque level.

ii) Charge the cylinder to its working pressure with high purity nitrogen.

iii) Using soapy water, leak test at the following positions:

a. Joint between the valve and cylinder.

b. Valve spindle.

c. Valve seat.

iv) On satisfactory leak testing, exhaust the cylinder to a 7 bar holding charge and label accordingly.

16 PIPE WORK CLEANING - BREATHING GAS SYSTEMS - NEW PIPE WORK

a) On completion of manufacture, new pipe work, up to 10 metres long is to be cleaned using the following procedure which must be strictly adhered to and documented to show full compliance:

i) Inspect the completed pipe work internal bores using a suitable clean endoscope.

ii) Carefully and thoroughly inspect the areas around couplings and adaptors for general manufacturing debris, e.g. grease, bronze particles and release agents.

iii) Clean the pipe work by flushing with steam. Use a steam generator capable of producing continuous quantities of clean, oil free, saturated steam, at a pressure not less than 2 bar at 150 Deg. C, for a minimum cleaning period of 10 minutes.

iv) Alternatively the pipe work can be cleaned by flushing with a solvent fluid, (i.e. Isopropy--Alcohol). Biox Biodeg can also be used for degreasing.

v) On completion of steam or solvent fluid cleaning, the pipe work is to be filled with Biox 02 Liquid (4 parts water :1 part Biox 02) and left for 1 hour.

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b) NOTE

vi) After 1 hour, the pipe work, filled with Biox 02 solution, is to be drained and flushed with demineralised water. Inspect samples as detailed in Section 21.

vii) On completion of flushing, the pipe work is to be dried by circulating heated high purity nitrogen.

viii) When dry, the pipe work is to be inspected using a suitable clean endoscope. If the pipe work is clean, seal each end using clean metallic blanking caps or suitable sealed polythene bags.

ix) If the brazing debris is not removed by the process detailed in Steps iii) to vi), it may be necessary to brush it off using a hard nylon brush. On completion of brushing, repeat the clean process detailed at Steps iii) to vi).

17 REFURBISHMENT OF EXISTING BREATHING GAS PIPE WORK

a) Proceed as follows:

i) Using a suitable clean endoscope, fully internally-inspect the pipe work for corrosion and braze; flux debris.

ii) Ensure that the endoscope instrument has suitable line adaptors, to allow any damaged area to be photographed. A record is to be kept of all internal damage or corrosion.

iii) If any corrosion or braze debris is present, it is to be removed using a hard nylon brush.

iv) Proceed to clean the pipe work as described in Section 16.

18 CLEANING OXYGEN GAUGES

a) Generally, suspect oxygen pressure gauges are to be replaced by new certified items.

19 INSPECTING CLEANED OXYGEN GAUGES

a) All oxygen gauge connectors are to be inspected as described in Section 21. The internal Bourdon tube cannot be inspected using readily available methods.

20 CALIBRATION OF OXYGEN GAUGES

a) The calibration of oxygen gauges is to be carried out using a dedicated oxygen clean, dead-weight tester and high-purity nitrogen as the calibration medium.

b) Alternatively, gauges with a full scale deflection up to 210 bar, may be calibrated using a standard dead-weight tester fitted with an oil seal (viton sac) and using a calibrating medium of demineralised water or solvent fluid.

c) All adaptors and connectors used during calibrations must be cleaned using a suitable solvent fluid and inspected with an ultraviolet light source.

d) During the calibration of a batch of gauges, periodic checks on the calibration equipment must be carried out to ensure that the cleanliness standard of that equipment remains at an acceptable level as detailed in Section 21.

e) On completion of calibration, using high purity nitrogen, gauges are to be flushed for 5 pressurising / vacuuming flushing cycles. On completion of cleaning or calibrating, gauges are to be identified and packed as detailed in Sections 22, 23 and 24.

21 INSPECTION PROCEDURE FOR ALL CLEANING PROCESSES

a) Inspection of equipment after cleaning processes are completed is as follows:

i) All inspection equipment is to be checked, using a long wave ultraviolet light (3600-3900 Angstrom), for oxygen cleanliness, i.e. free of areas of fluorescence.

b) NOTE
When illuminated by the ultraviolet light, deposits of hydrocarbon (oil or grease) will fluoresce.

ii) Gauges, breathing gas cylinders and end fittings are to be checked around the connector area, using ultraviolet light, for oxygen cleanliness.

iii) A sample of the final cleaning solution is to be allowed to evaporate in a porcelain dish or similar receptacle.

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iv) When dry, the receptacle is to be inspected as follows:

a. Check under normal white light, that there are no fibre particles or liquid visible.

b. Check there is no visible area of fluorescence in the receptacle when viewed under ultraviolet light.

c. Use a clean White filter paper to wipe the receptacle and check that there is no visible fluorescence when viewed under an ultraviolet light.

v) If any contamination is detected during checks detailed in Step iv), the component is to be re-cleaned until free of all contamination.

vi) All end connections of gauges and cylinders are to be inspected using the long wave ultraviolet light.

22 HANDLING, PRESERVATION AND PACKING HANDLING PRECAUTIONS.

Operators must ensure that gloves are worn before commencement of these operations.

a) Procedures for handling are as follows:

i) Sealing and packing is only to be carried out in a controlled area free of oil or dust contamination.

ii) Packaging material damaged during packing is not to be used.

iii) Packaging material is to be free from contamination.

iv) Care is to be taken when handling packed and sealed components to maintain the integrity of the sealing and packaging.

v) Gloves are to be worn when removing oxygen-clean items for use from their packaging.

vi) Any item in an opened or damaged package is NOT to be used for Oxygen service. Such items are to be considered contaminated and must NOT be used until they have been oxygen-cleaned.

23 PRESERVATION

a) No preserving medium is to be used on oxygen-clean items.

24 SEALING

a) Procedures for sealing components and their packaging are as follows:

i) Items cleaned for oxygen use are to have their apertures carefully cleaned. Any internal fitted plastic bungs, tape or other methods of sealing apertures that may lead to material becoming lodged inside the aperture, are NOT to be used.

ii) Oxygen - clean items are to be heat-sealed in two polyethylene bags with an oxygen warning label placed between the layers.

iii) If the heat-sealer is not available sell-sealing polyethylene bags are to be used.

iv) Items are only to be sealed in a controlled area as defined in Section 3.

25 STORAGE

a) Storage procedures are as follows:

i) Cleaned items are to be stored in a sheltered area and are not to be subject to any adverse weather conditions, flooding or accidental damage. The storage area temperature is to be maintained between -130 C. and +550 C. Storage under tarpaulins is not permitted.

ii) Packages containing cleaned items are to be visually inspected by the store keeping authority as follows:

a. On receipt.

b. After any movement of the item(s) within the store.

c. Immediately prior to use.

iii) If the package or package sealing of a cleaned item is found to be damaged, defective or inadequate and any doubt is raised regarding the integrity of the sealing arrangements, the item is NOT to be used.

b) NOTE
Items received from contractors with damaged sealing or packing arrangements are NOT to be accepted for service.

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GAS AND LIFE SUPPORT PIPE WORK PROCEDURE FOR TESTING AND COMMISSIONING

All gas pipes are linked in such a way so as to provide easily tested and cleaned sub-assembles. The pipes are filled with potable water via a filter system. Open pipe ends are closed off.

A hydrostatic test pressure of 1.5 times the design pressure is applied for a period satisfactory to the surveyor. During this pipes and fittings are examined for integrity.

Some pipes having a test pressure equal to or less than 15 bar pressure tested using air.

After completion of appropriate hydrostatic testing the pipe system are flushed clean by using the re-circulation filtration method detailed in Appendix 1. This does not apply to water/drain lines etc.

Pipe systems intended for use with gas containing high levels of oxygen (i.e. systems having an oxygen content greater than 25%) are further cleaned by the method detailed in Appendix 2.

On completion of satisfactory cleaning, the pipes are reconnected to their respective system. A gas pressure leakage is completed on each gas pipe.

The method of testing gas pipe work is as follows :-

Using dry clean air each pipe in turn is pressurised to 50% of maximum working pressure. Each pipe joint is checked for leakage with the use of a proprietary leak detection agent e.g. SNOOP.

The pressure within the pipe is increased to the maximum working pressure and is rechecked for leaks. If the pipes being tested are not to be used for helium or heliox then this gas pressure test is completed using air only. A pressure drop of 0.5% per 12 hours should not be exceeded, taking into account any temperature The duration of this test should be at least one hour.

Helium or heliox lines are only checked for air leakage with SNOOP at this stage. For pipes which are to be used for helium or heliox the following procedure is used:-

Air pressure within the pipe is reduced to 80% of the maximum pressure, the pressure is then returned to the maximum pressure using pure helium gas and is again checked for During this leak test a pressure drop of 0.5% per 12 hours should not be exceeded, taking into account any temperature change. The duration of this test should be at least one hour.

BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

Open ended vent lines in practice are not subject to any significant differential pressure. They are given a nominal design. pressure in order to size the pipe scantling for practical in service use and are carefully constructed to good working practices. The hydrotest, cleaning and gas pressure tests mentioned above do not apply to these lines. They do however require to be visually examined under operational conditions to ensure than no leakages or physical damage is present and signed off accordingly.

Water and hyperbaric hydraulic lines are to be hydrostatically tested to 1.5 x the Design Pressure. This pipe work may be sufficiently cleaned by hand prior to final assembly, in which case no further cleaning procedure is required after the hydrotest (discuss and agree individual cases with the local certifying authority surveyor). Open ended drain lines only require to be visually examined under operational conditions to ensure that no leakages or physical damage is present and signed off accordingly.

BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

APPENDIX 1

FLUSHING PROCEDURE FOR GAS AND LIFE SUPPORT (<25% OXYGEN) PIPES

EQUIPMENT REQUIRED FOR CLEANING PIPE SYSTEM

A. Biox 02 Liquid / water solution 1:4
B. Pressure pump (minimum flow rate of 40 litres/min.) with in-line filtration to 10 micron.
C. Spare filter elements for the above.
D. Compar particle comparison sampling unit.
E. Compar comparison slides and microscope.
F. Lint free cleaning tissue.
G. A clean tool kit.
H. Pipe identification markers.
I. Flushing samples records book.
J. Miscellaneous interconnection hoses and fitting adaptors.
K. Spare field sample monitor kits.
L. Plastic fluid containers.

METHOD OF FLUSHING PIPES

On completion of hydrostatic testing individual pipes are linked into a series of sub-assemblies. Smaller diameter pipes are not linked with 3/4" or larger diameter pipes. Pipes above 1" internal diameter should be flushed using a proportionally larger pump flow rate (in proportion to internal cross sectional area).

The pipe system is filled with potable quality water. One end of the system is connected to the pressure pump discharge whilst the other free end is connected to the filtration unit inlet. The discharge of the filtration unit is coupled to a header tank containing the Biox 02 Liquid /water solution. The pressure pump continually draws from this header tank.

A mixture of Biox 02 Liquid to water in the ratio of 1:4 is required.

The pump is run for a short period to ensure that the Biox 02 Liquid solution is distributed throughout the pipe system. The system is then left to 'soak' for 15 minutes.

The pressure pump is again run for a period of 45 minutes to circulate the Biox 02 Liquid solution via the filtration pack.

After this time the Biox 02 Liquid solution is blown from the pipes and back into its tank using clean, dry air. Potable water is then pumped through the pipes to remove any remaining droplets of Biox 02 Liquid solution.

BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

Complete removal of Biox 02 Liquid from the system is tested by comparison of the supply and system discharge water PH values.

The flushing out of the system in this way is continued until the difference in PH value is less than 1 PH.

The pipeline assembly is then returned to the 'closed loop' condition and flushing continued using potable water, via the filtration pack, for a minimum of 1 hour.

Samples of the system fluid (water) are taken after this time and inspected for particle content. The Compar comparison system is used and flushing is continued until the correct Compar standard is established in accordance with the list below. (See Appendix 3 for Compar Table)

Compar 4 - All breathing air or mixed gas systems.
Compar 6 - All hydraulic pipeline systems.
Compar. 9 - Miscellaneous potable water systems.

All fluid samples taken are noted in a samples book and given an appropriate identification number.

When the pipe system reaches the required cleanliness standard the water is blown from it using clean air or nitrogen until dry.

On completion of the above, the individual pipes within the flushed circuit are blanked off or reconnected into the appropriate part of the system.

For cleaning oxygen pipes or Heliox mixture pipes having an oxygen content in excess of 25%, additional cleaning is required. (See Appendix 2)

BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

APPENDIX 2

FLUSHING PROCEDURE FOR OXYGEN AND ENRICHED MIX (>25% OXYGEN)

SERVICE PIPES

EQUIPMENT REQUIRED

A. Equipment as listed in Appendix 1.
B. Biox 02 Liquid / water solution 1:4 kept specifically for this task in a heated tank (approximately maintained at 60 C.) and filtered to Compar 4 standard.
C. Inert Gas - Nitrogen, certified clean to medical standards.
D. Distilled water kept specifically for this task in a tank and kept filtered to Compar 4 standard.

METHOD OF FLUSHING OXYGEN AND RICH MIX PIPES

On completion of flushing the pipes as detailed in Appendix 1, the pipes for oxygen service are reconnected to the pressure pump and hot Biox 02 Liquid / water tank in the same way. Preferably they are kept connected and the adjustment made by using a valved manifold system.

The pipe system is then filled with the hot Biox 02 Liquid / water via a dedicated 10 micron filter. The hot Biox 02 Liquid / water is then circulated via the pressure pump and filter in a 'closed loop' arrangement for a minimum of 30 minutes.

The hot Biox 02 Liquid / water is then blown out of the pipe system and back into the tank using a clean inert gas.

Distilled water is then pumped through the pipe system for 15 minutes to remove droplets of the Biox 02 Liquid / water solution. The PH value should be less than 1 and the distilled water discarded when it is above this.

The distilled water is then blown out of the pipe system and back into the tank using a clean inert gas.

On completion of the above, each pipe is blanked off or reconnected into the appropriate part of the system.

BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

RELATIVE RAPIDITY OF BIOX 02 LIQUID EFFECT AT DIFFERENT TEMPERATURES

TEMPERATURE DECREES C.	RELATIVE EFFECT
O5	0%
10	4%
20	10%
30	20%
40	35%
50	55%
60	95%
70	100%

As in all chemical reactions temperature is of great importance for the rapidity of the process.

In practice the lowest temperature recommended is +10 C.

The liquid can be warmed even up to 70 C. where the time of treatment is cut down to 1/10 compared with a treatment at 20 C.

BIOLOGICAL BIOX ULTRASONIC CLEANER SOLUTION

COMPAR CLEANLINESS STANDARDS

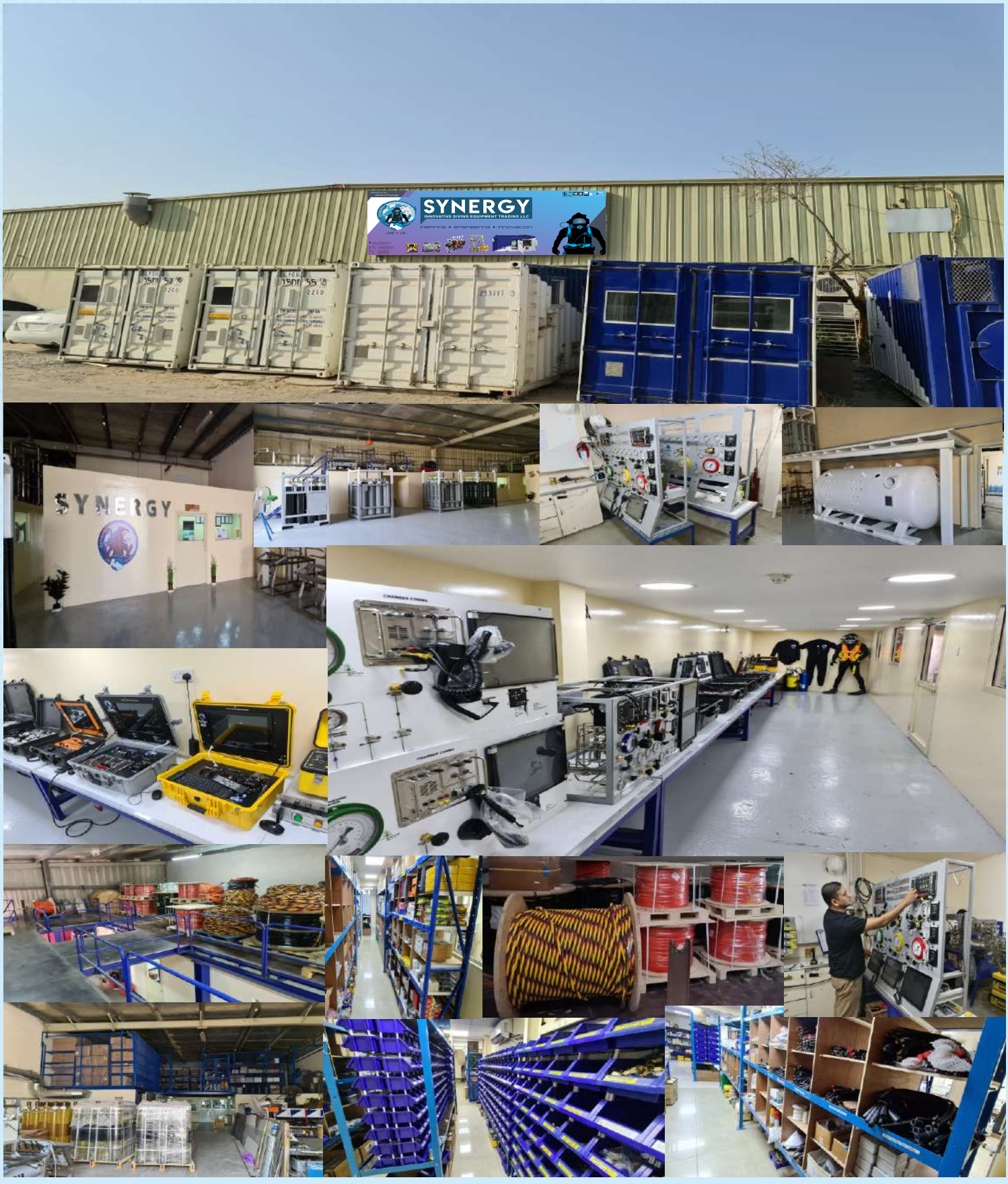
CONTAMINATION LEVEL CLASSES FOR FLUID SYSTEMS

PARTICLE SIZE

CLASS	>100	50-100	25-50	15-25	10-15	5-10	1-5	PARTICLE COUNT
							times 1000	TIMES 1000
1	7	15	94	294	701	1617	30.88	336.1
2	7	15	104	370	1810	22320	420.00	444.6
3	7	15	133	529	3677	50050	850.61	915.0
4	22	51	439	1744	12137	165188	2840.0	3019.6
5	32	89	820	3480	29143	450681	8568.0	9052.4
6	43	128	1220	5220	42181	714240	14280.0	15043.0
7	47	147	1415	6090	50142	857088	17186.0	18051.2
8	57	185	1805	7830	67240	1142784	22848.0	24067.0
9	68	224	2196	9870	84051	1428480	27720.0	29244.6

Count per 100 ml sample volume

SYNERGY INFRASTRUCTURE



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Contact us

29th Street, Amman Road, Behind Al Huraiz Est. For Industry,
Al Qusais, Industrial Area – 1,
Dubai, United Arab Emirates

Tel : 009714 2580533
Fax : 009714 2580534
UAE : 00971505648178
UK : 00447951966260

Website : www.synergyequipment.com
Email : ram@synergyequipment.com
For Sale : info@synergyequipment.com