AQUACENTRUM
DEN HELDER

ANEP 86
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ANEP 86

- ANEP 86 is a publication used by all NATO Countries who operated Submarines
- The ANEP 86 consist of three chapters
  - **CHAPTER 1 - MINIMUM CONDITIONS FOR SURVIVAL IN A DISTRESSED SUBMARINE (DISSUB) PRIOR TO ESCAPE OR RESCUE**
  - **CHAPTER 2 - SUBMARINE ESCAPE AND SURFACE SURVIVAL PERSONNEL EQUIPMENT (SESSPE)**
  - **CHAPTER 3 - MEDICAL STANDARD FOR SUBMARINE ESCAPE TRAINING TANK CANDIDATES**

Safety Standards

- For us here at the SAMAP conference chapter 2 and 3 are not relevant as they have nothing to do with Air monitoring or Air purification.
- How ever Chapter 1 is relevant to us as the minimum conditions for survival in a distressed submarine are laid out here.
- The document in itself is useful to give standards for air inside the submarine during normal operations but also what kind of gasses should we monitor during submerged operations but also what kind of gasses are released during a fire and what are the safe limits for these gasses to breath in without emergency breathing equipment.

Different type of submarines

At the moment there are three types of submarines in operation:

- 1 The traditional Diesel submarines
- 2 The air independent Submarines
- 3 The nuclear Submarines

Different Operational Profiles

- For Diesel submarines the atmosphere on board is important but because they have to snort regularly the atmosphere on board is replaced during snorting and limits go back to normal conditions
- Air Independent Submarines can stay submerged between 8 to 12 days, They have to pay more attention to their atmosphere as it is not replaced as regularly as in a diesel submarine and there also could be more contaminants in the air from the air independent powerplant.
- Nuclear Submarines stay submerged for more than 90 days and rely heavy on their Nuclear Powerplant to produce Oxygen by hydrolysis from Seawater and scrub the air with Amines. Both processes produce unwanted gasses like for instance Hydrogen that you have to ventilate outside the submarine.

Measuring the Atmosphere

- During a dissub situation conditions in all three submarines are probably the same, they have no power and have to use Non-Powered means like Oxygen Candles or LioH curtains to scrub the air inside the dissub,
- To monitor the air they probably have to use battery powered equipment like the Analox MKlllP or Drager test tubes.

Monitoring gasses

- The document gives advice to monitor the following gasses:

- a Oxygen O2
- b Carbon Dioxide CO2
- c Carbon Monoxide CO
- d Chlorine CL

Monitor Extra Gasses

The ANEP 86 also advices that consideration should be given to monitor the following gasses :

- a. Hydrogen chloride HCl
- b. Hydrogen sulfide H_2S
- c. Ammonia NH_3
- d. Oxides of Nitrogen NO_x
- e. Hydrogen cyanide HCN
- f. Hydrocarbons $C_xH_x(X)$
- g. Hydrogen H_2
- h. Humidity H_2O
- i. Refrigerant gases.

Safe Limits

- The ANEP 86 gives the Safe limits for the gasses normally present in a submarine and dangers if you exceed these limits and what the symptoms are if you exceed these limits.
- However the document is vague about the safe limits for other gasses and what other gasses could be in the atmosphere after a fire or accident. How easy is it to measure these gasses and is there equipment available that could be used on submarines?
- Although there is some literature and studies mentioned in the ANEP these studies are hard to find and most of them are more than 30 years old.
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Discussion

- What I hope to achieve during this discussion is to find some answers to the question what should we measure, decide on safe limits for these gasses and is there equipment available to measure these gasses and can they be operated by submariners