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Aviation medi
Life saving
Clothing
Cold
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Mersolat H-30

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SPECIAL
PROTECTIVE GARMENT FOR AVIATORS
(SEENOTSCHUTZGERAT)

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COMBINED INTELLIGENCE OBJECTIVES
SUB-COMMITTEE

~~CONFIDENTIAL~~

I.G. FARBENINDUSTRIE A.G.

HÖCHST a/M GERMANY

SPECIAL PROTECTIVE GARMENT FOR AVIATORS (SEENOTSCHUTZGERÄT)

9 May 1945

Report by

JEAN G. KERN
CWS Hq ETOUSA

29 May 1945

CIOS BLACK LIST ITEM 22
Miscellaneous Chemicals

COMBINED INTELLIGENCE OBJECTIVES
SUB-COMMITTEE
G-2 DIVISION, SHAEF (REAR) APO 413

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Major R. E. Richardson..... CMHQ
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SPECIAL PROTECTIVE GARMENT FOR AVIATORS (SEENOTSCHUTZGERÄT)

1. INTRODUCTION.

a. The chemical information concerning the subject was obtained from Dr. Nuesslein, Director of the Dye and Detergents Application Division of I.G. Farbenindustrie A.G., Höchst a/M on 9 May 1945.

b. The construction of the garment itself was obtained at the Klepperwerke (Rosenheim) on 22 May 1945, from Mr. Karl Stich, part owner of the firm and Teo. Schleypen, assistant to Prof. Dr. Otto Mecheels. The latter was chiefly concerned with the design of the suit, being a well-known textile and garment consultant, and is now living in retirement at Bönnigheim by Bittigheim, north of Stuttgart. Prof. Mecheels was not interrogated.

2. DEVELOPMENT.

a. The losses at sea, especially during the cold season, run especially high since death occurs not only through drowning but also through lowering of the body temperature. The use of special life boats in which the rescued personnel were immediately warmed up with warm water proved only partially successful. In many cases death occurred soon after rescue from the water through heart attack; thus it was established that no human life could be saved if the body temperature had reached a low of 31°C; therefore, a suit had to be designed which would protect the victim from freezing. In order to maintain adequate body fitness, the suit had to be permeable to air.

b. The chemical part of the problem was based on the following idea:

(1) Cold water seeping through the protective garment has to be displaced by a stable foam developed therein for this purpose. Thus the body heat is prevented from being removed by the continual flow of cold water; in addition, the gas contained in the foam is

little by little heated by the radiating body heat. Removal of heat is therefore very substantially decreased. It was demonstrated that the use of such a foam garment actually permitted the wearer to remain in ice cold water without much trouble for many hours.

(2) The problem therefore consisted in finding a foam generating composition which would produce an abundant and stable foam with cold sea water (average winter temperature of North Sea water is about +4°C), such foam must evenly disperse and remain within the garment to form a protective layer for an adequate length of time.

3. SOLUTION.

a. Foaming Compound.

(1) A great many compositions were tested by the Höchst laboratories. Among these a combination of a synthetic foaming agent of the sulfonate type, sodium bicarbonate, and an acid to produce CO_2 proved to be best. In order to avoid any irritation of the body skin, the mixture of bicarbonate and acid had to be used in about stoechiometrical quantities with the further proviso that the free acid itself would not be harmful to the skin. This mixture must not be hygroscopic.

(2) Of special interest was citric acid which very readily dissolves in sea water, thus causing a quick formation of foam. The use of this acid was found to be indicated due to its tri-basic character; permitting the incorporation of a large amount of bicarbonate on a % weight basis, into the foaming composition.

(3) The best foaming agent consisted of a special "Mersolat type", i.e. Mersolat H-30 a synthetic aliphatic sodium sulfonate in C 13.5 which contains approximately 30% salt.

The initial I.G. foaming powder No. 4 compounded for that purpose had the following composition:

24.4% - Mersolat H-30+
41.46% - $NaHCO_3$
34.14% - Citric Acid

(4) I.G. was to supply a first shipment of 30 tons of this mixture sufficient to produce 15,000 garments. Delivery, however, could not be effected due to shipping difficulties of the Mersolat

+ See addendum.

and of the citric acid from the Wolfen plant and from Prague (Bohemia) respectively. A substitute therefore had to be worked out which was later known as Schaumpulver I.B. which had the following composition:

24.4% Igepon AP extra conc.+
30.9% $NaHCO_3$
44.7% Benzoic acid

(5) This product was found to be somewhat less efficient than foaming powder No. 4 but proved entirely satisfactory according to tests made by Prof. Mecheels, the inventor of the garment. Four tons of this material were delivered to the Klepperwerke in Rosenheim (Bavaria); further deliveries were stopped due to occupation of the Höchst plant by Allied troops.

b. The Garment.

(1) The protective suit designed by Prof. Mecheels consists of a three layer fabricated cloth consisting of:

(a) Outside layer - cellulose acetate silk poplin

(b) Middle layer - A viscose silk plush called Wollinplush (white)

(c) Inner lining - Viscose artificial silk material (white heavy lining)

(2) The outside fabric (acetate) appears to be simply dyed and to contain no further prepare. The back side of the middle layer of Wollinplush is treated with a liquid soap called "Preukutan", alleged to be manufactured by Boehme Fettchemie, Stuttgart, which could not be further identified by the interrogated witnesses. It appears to be a solution of a synthetic detergent, oily in character, the exact nature of which could best be identified at the source of manufacture.

(3) The treatment of the Wollinplush is quite simple and consists merely of spot applications with the "Preukutan" oil. After drying, the foam producing powder is sprinkled in the pile of the plush which is applied pile face against the outside acetate silk layer. The inner layer of viscose silk faces the "Preukutan" prepared back side of the Wollinplush. In order to retain an even distribution in the fabric, the three layers are quilted together in approximately 2"-3" diamonds. Each such suit contains approximately 2 kilos of foaming powder.

+ See addendum.

4. USE.

a. The suit is worn on top of undergarments below the outer flying suit. It comprises a jacket with a tight neck band of sponge rubber, a pair of trousers, inner shoe soles, and gloves. Decidedly lacking are protective means for the neck. A "foam cap" cannot be worn since the foam very readily obstructs the eyesight. The neck therefore has to be greased. The head of the wearer is held above water by a floating neck piece. The use of this latter device was found to be quite necessary since the neck is the most cold-sensitive part of the body and thus has to be kept above water level continually.

b. The suit was especially designed for naval fliers operating in Norwegian waters but was later to be extended to general naval use.

c. It is stated that a person equipped with a complete outfit can exist in about 0°C water for a period of 3 hours or more. It is also stated that the insulating mass is effective for a period as long as 60 hours.

5. AVAILABILITY OF MATERIALS.

a. The suits were first manufactured by the Technikum für Textile Industry at München-Gladbach. After destruction or occupation of the latter, their fabrication was transferred to the Klepperwerke (Rosenheim). The impregnation of the cloth with "Preukutan" took place at Rosenheim as well as the cutting of the suits. The foam powder was sewed in the garments at Endorf and Prien, both subsidiaries of the Klepperwerke, situated near Rosenheim.

b. A total of between 10,000 and 15,000 suits in 3 sizes is said to have been delivered to the Luftwaffe Bekleidungsamt between early 1944, and March 1945, when operations were halted due to the occupation. There are on hand enough cut materials to prepare 1,500 additional suits. Piece-good materials are available for an additional 2,000-3,000 suits. There is enough foaming powder I.B. on hand for about 5,000 suits.

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ADDENDUM

1. Mersolat H-30.

This product is a soap substitute made by saponification of Mersol with caustic soda:

$$R - SO_2Cl + 2NaOH \quad R - SO_3Na + NaCl + H_2O$$

Mersol itself is an aliphatic sulfon-chloride derived from Kogasin, a fraction of Fischer-Tropsch oil, having a distillation range of 230-330°C and a chain length varying from C_{13} - C_{15}.

Mersolat H-30 represents the sodium sulfonate of this Kogasin derivative standardized with 30% NaCl. It is believed that any of the synthetic detergents at present made in the U. S. from petroleum fractions in C_{12} - C_{13} (alkyl-aryl sulfonates, straight aliphatic sulfonates, etc.) might be used as a suitable substitute.

2. Igepon AP extra conc.

This product is one of the outstanding synthetic detergents made by I.G. Farbenindustrie A.G., Höchst a/M. It is the sodium salt of the oleyl-ester of oxy-ethane-sulfonic acid $C_{17}H_{33}CO.O.CH_2.CH_2.SO_3Na$ and contains very little salt.

The product is slightly yellow in color, soluble to a clear solution in H_2O, yielding a pH of 7.1-7.5 in 5% solutions.

It is believed that Igepon AP extra conc. can be replaced by any salt free synthetic detergents made from petroleum fractions of the straight aliphatic chain or alkyl-aryl chain type, sulfonated.

NOTE: - Mersolat H-30 is more fully described in Report on I.G. Farbenindustrie A.G., Leuna (Germany) of 10 May 1945, by W. S. Calcott, CWS Hq ETOUSA.

Process on Igepon AP extra conc. will be covered in another report.