

Transport of Fuel to Antarctic Stations by “Cigar”

S. Rakusa-Suszczewski

IBB Polish Academy of Sciences Private address: Warsaw 02-535, Łowicka 51/55, Poland

I. Introduction

The Council of Managers of National Antarctic Programs (COMNAP) Fuel Manual (Version 1.0, 01 April 2008) states, “The transfer of fuel oils from resupply vessels to shore based storage facilities, and between individual storage facilities on stations or bases, are potentially hazardous operations.”

Fuel transported to Antarctic stations by ships and tankers is stored in tanks on the Antarctic continent or islands. Pumping of the fuel from such vessels to stations takes place through rubber pipes, which may not always be secure. Thus, fuel may leak onto ice, onto land, or into the sea (Figs. 1, 2). When the distance between the fuel tanks and vessel delivering the fuel increases, so too does the risk of leakage from the pipe increase. Winds, tides, ice movement, operation speed, and a ‘human factor’ are all important. Particular risks of fuel leakage arise through movement of joints and disconnection of the rubber pipes. Fuel may also be delivered in barrels on a sleigh, towed considerable distances over sea-ice by a tractor from the ship to fuel tanks. Weakness and cracks in fast-ice elevate the risk of loss of such cargo, and also of the tractor and operator. Personal observations and experience have led me to present the following proposal.

II. Technical specifications

I propose the construction of two metal cylinders, or ‘cigars’ (Fig. 3) with a double partition wall, with each cylinder’s external dimensions being 6 m long and 2 m in diameter, or 18.8 m³ per cylinder. The fuel capacity of each cylinder is 15.2 m³. Two such ‘cigars’ are connected lengthways in a manner that allows them to roll together. The combined structure permits the transport of 30.4 m³ of fuel. The transport of such a volume (30.4 m³) corresponds to ~152 barrels, if each barrel contains ~0.2 m³ of fuel. The surface of the 6 x 4 m sleigh could accommodate 96 such barrels. Both ‘cigars’ can form a barge with an outboard motor as we used at Henryk Arctowski Antarctic station in the South Shetland Islands (Fig. 4). This device can sail independently between the supply vessel and the beach, or ice edge. Once at the beach it can be ‘rolled’ onto the land or ice by being pulled by a tractor, and then ‘roll-towed’ by the same tractor to the station’s fuel tanks or storage site. It could also be used at stations on the Antarctic continent, and those on fast-ice.

Acknowledgements

Thanks to Malgorzata Benedek for the drawn figure, and to Stuart Donachie for editing my English.

References

- [1]. COMNAP Fuel Manual V1.0 01- April-2008. The latest version of this manual can be found online at www.comnap.aq

Fig.1. Transfer of fuel through flexible pipes over sea-ice.

Photo: S.Rakusa-Suszczewski



Fig.2. Fuel may be transferred through flexible pipes from ships, or in discrete containers such as barrels.



Photo: T.Janecki

Fig. 3. Schematic representation of proposed fuel-carrying ‘cigars’. See text for further details.

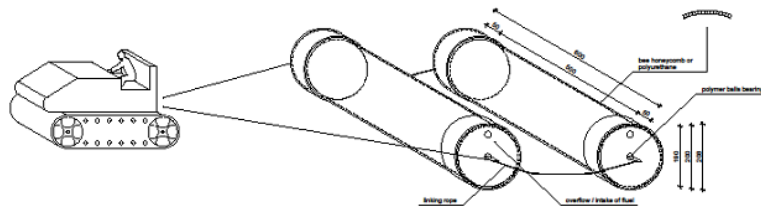


Fig. 4. The proposed device may form a ‘barge’ once fitted with an outboard motor. The example shown here has been used at the Henryk Arctowski Antarctic station in the South Shetland Islands.



Photo: T.Janecki