SOLID ROCKET PLANT

RESEARCH AND DEVELOPMENT IN SUPPORT
OF THE POLARIS PROGRAM

64-5

CONTRACT NOw 63-0627c (FBM)

TASK V

DEVELOPMENT OF HIGH STRENGTH IMPREGNATED
ROVING FOR FILAMENT WINDING

PERIOD COVERED: 10 JUNE TO 9 AUGUST 1963

REPORT 0627-V-2

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ABSTRACT

This is the second of a series of bimonthly reports describing progress in a program conducted to improve uniformity and strength utilization in preimpregnated roving for filament-wound rocket chambers. The work, authorized by Contract NOw 63-0627c (FBM), Task V, is being conducted for the Bureau of Naval Weapons in support of the Polaris program.

PREFACE

This program is under the sponsorship of the Special Project Office, U. S. Navy, with H. Bernstein as Technical Director.

The work will be conducted under the cognizance of I. Petker, Senior Engineer, and M. Segimoto, Development Engineer, Structural Materials Division, Azusa. K. W. Smith, Filament Winding Consultant, Propulsion Research and Development, Division 4600, and R. A. Galuzevski, Senior Scientist, Polaris Materials and Fabrication Research and Development, Division 6300, Sacramento, will be responsible for the Technical Management of the program.

I. INTRODUCTION

This report is the second of a series of bimonthly reports covering performance for the period of 10 June through 9 August 1963.

II. SUMMARY

A purchase order for the entire amount of experimental lots of glass products has been placed with Owens-Corning Fiberglas Corp; however, the order was placed more than a month later than anticipated. The delay was in final negotiation of some of the contractural details with the glass supplier, and a redistribution in the quantities of the various types of glass products to conform to the requirements of the final work plan.

The production of the S-994 glass for this program is scheduled to start the first week in September. Seventy-five percent of the material will be delivered within 90 days of the date of award of the contract. According to Owens-Corning Fiberglas Corp., the balance of the order may take as long as six months to fulfill. This 25% of the order includes a single-end, two-end, and four-end-count rovings with 0-twist and a standard single-end roving, all wound on a standard 3-in. ID core with a way-wind pattern. The low productive capacity of the special machine prohibits completion of the order in time. To produce an 0-twist roving, the strand must be unspooled from the outside of a forming tube while the tube turns simultaneously at the same speed and in the same direction. These materials will be shipped as fast as they are produced to allow continuous material evaluation and to minimize the schedule slippage. By completing the order before the allocated time and shipping these products as they are produced, the current schedule slippage of more than one month will be substantially, if not completely, recovered.

All of the special S-994 glass roving will be produced at the Huntington, Penna, plant of Owens-Corning Fiberglas Corp. All materials will be manufactured under the same conditions as for 20-end S-994 HTS roving. Modifications will be made as necessary in the roving equipment to wind the 0-twist material, twisted yarns, and single-strand rovings. Deviations from standard conditions will be made only to create the variations in the HTS sizing for the special experiments on the amount and degree of sizing cure.

III. TECHNICAL DISCUSSION

A. OBJECTIVE

The objective of this program is the development of 20-end preimpregnated roving with high linearization between the ends in an effort to improve the quality of preimpregnated rovings with respect to both uniformity and maximum strength. The program will require a cooperative effort between a producer of glass filament, an impregnation source, and a structural fabricator. During the program, preimpregnated material will be produced from various types of glass strands. The types will include forming-tube stock, single-end yarn with various levels of twist, low-end-count roving, and plied yarns. Additional studies will determine the effect of twist-on strength and the effect of sizing (HTS) variations on resin pickup and wet-out of roving.

B. SCHEDULE

The program is scheduled to be completed in 12 months. The performance is now over one month behind schedule because of a delay in receiving the necessary glass materials for the evaluation. This schedule slippage will be made up during the balance of the program.

C. ACCOMPLISHMENTS

An advance quotation from U.S. Polymeric Chemical, Inc., has been received for the development of linearized-end preimpregnated material. Because a large portion of the program is devoted to the development of 20-end preimpregnated rovings from single and low-end-count input glasses, and the number of creel positions available in the production facility is insufficient, a considerably longer impregnation time is required to perform the task than was originally estimated. To produce the preimpregnated rovings according to the original quotation, 43% of the program funds will be required. The sample size of each of the types to be evaluated may have to be reduced. This matter will be resolved by the time of delivery of the materials from Owens-Corning.

Only one impregnator was considered for the development of linearized-end preimpregnated rovings. A considerable amount of development was done at U.S. Polymeric under a program sponsored by the Bureau of Weapons and in order to utilize the data developed from the previous programs and to maintain continuity, the same conditions and facilities should be used.

D. FUTURE WORK

Some experimental lots of glass filaments are expected to be received in September. Preliminary studies as outlined in Phase I of the work plan will be started to establish the test procedures to be used for material evaluation. Also, quality inspection of incoming glass products for Phase II material evaluation will be started.