DEVELOPING OF SAILCLOTH TO BENEFIT FROM WINDS DEFINED AS LOW INTENSITY ON BEAUFORT SCALE WITH THE HIGHEST EFFICIENCY

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EXTENDED ABSTRACT

In the development of sails sail clothes have a big importance. Present applications on sail clothes include techniques based on yarn, finishing and lamination. In this project a sail cloth has special construction can benefit from acting effect of winds even at low speed will be developed as a woven fabric. The surface of fabric which clutch the wind successfully will be designed inspiring by the tubercle structure of humpback whale fin. Wavy surface is the aim of design. In this way the frictional area increased and the wind gains a suitable precession. With this precession the suction effect of flow for movement increases. Herewith the minimum spacing on Beaufort Scale for the acting of sails can be reduced to 3.5-4 knots from 4-6 knots. The project aims to provide the basic properties of sailcloth such as UV resistance and sea water resistance using high tenacity polyester yarn as well**.**

Key Words: wind flow, construction, humpback whale fin, sailcloth, Beaufort Scale

1. INTRODUCTION

Sailcloth is the part of sail which convert the wind energy to kinetic energy. The main principal of motion of sails is explained with Bernoulli's rule. According to Bernoulli's rule low and high pressure sections occurs on the different surfaces of body under effect of fluid. The pressure difference creates a suction effect and due to this effect the sail starts to move. Tubercle structure increases the frictional area and makes the surface more available for precession. In different areas of industry such as energy and aeronautics used the same approach of biomimicry for designing of propellers and turbines considering humpback whale fin to use wind energy efficiently according same principal. Success of this fabric construction developed for sail clothes also can be measured getting reference the decreasing of minimum values on Beaufort Scale for the motion of sails.

2. MATERIALS AND METODS

The surface of fabric which clutch the wind successfully would designed inspiring by the tubercule structure of humpback whale fin. High tenacity polyester is the raw material of developed fabric has the tenacity 8.80-9.00 grams for per denier. Wavy surface is the aim of design that is tried to 10 different weave construction(Table 1 and Figure 1). For the structures have ability to reach the aimed results computational designs are prepared on EAT design software. The ten samples are tested in wind tunnel embodiments laboratories.

Table 1. Experiment Plan

Sample	Code	Materials
A- Referance Sailcloth	1	%100 Polyester
B- Tubercule Structure Fabrics	1	%100 High Tenacity Polyester
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

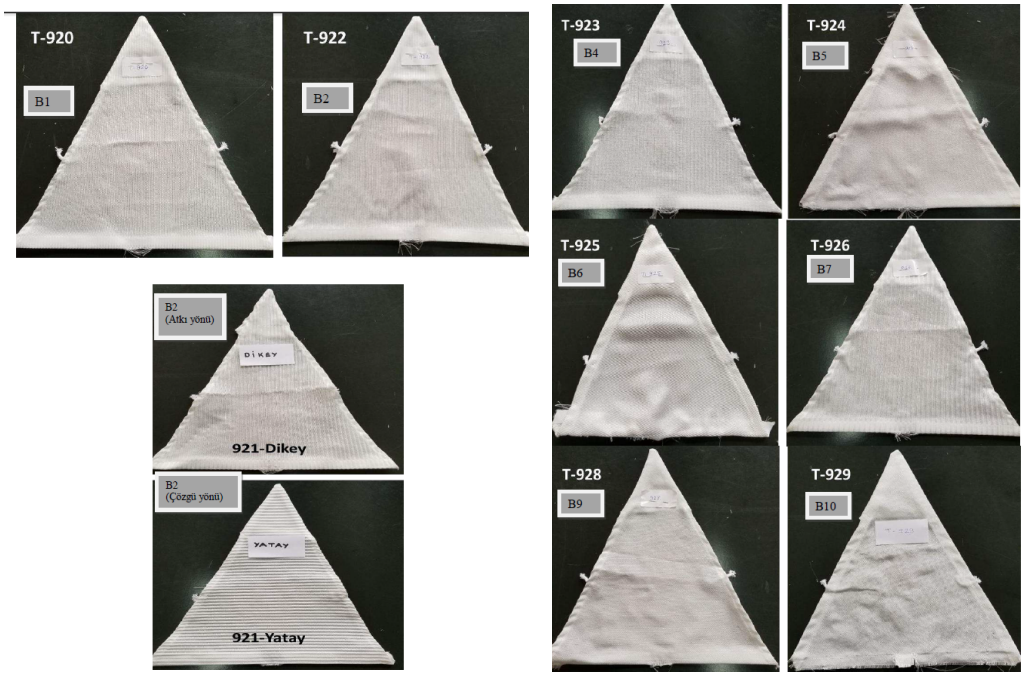

Figure 1. Tubercle Structure Fabrics

2. RESULT

In this way the frictional area increased and the wind gains a suitable precession. With this precession the suction effect of flow for movement increases. Herewith the minimum spacing on Beaufort Scale for the acting of sails can be reduced to 3.5 knots from 4 knots. B7 sample was selected according to wind tunnel results (Fıgure 2).

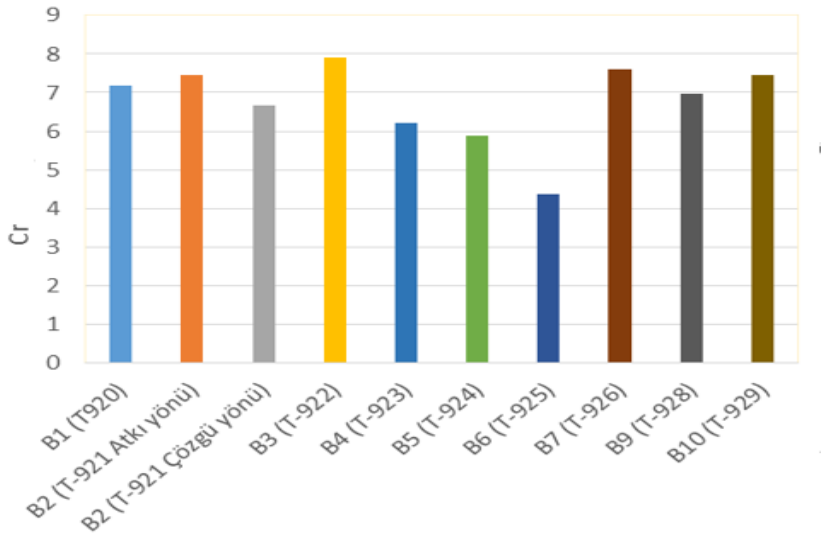

Figure 2. Wind Tunnel Results

3. CONCLUSION

Owing to developed structural design of fabric minimum acting values of sails marked on Beaufort Scale could be decreased in proportion as 12 %. Through the high tenacity polyester yarn the basic performance properties have provided also tenacity could be increased in proportion as 10%.

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