Case Study – Material Selection and Physical Testing for Protective Eyewear Device

Challenge

Save Phace, Inc. is manufacturer of protective plastic eyewear [masks] products developed for use in the paintball, law enforcement, and military industries. The Save Phace mask has become synonymous with durability and "sick" custom graphics, used by soldiers, police, and "paintballers" alike, it has received outstanding customer reviews and has even been featured in the movie Jackass: Number Two (2006).

Engineers at Save Phace had spent over three years and thousands of hours in the development of their unique and extremely durable low profile tactical mask, equipped with adjustable ventilation, custom graphics, and multiple lens configurations.

The challenge for Save Phace was selecting a suitable plastic resin for use in the manufacturing a high quality lightweight mask that capable of being decorated custom graphics. More importantly, the material selection process must account for applicable standards and test methods intended for protective eye and face wear, and with consideration to foreseeable [service] use applicable to the Save Phace Tactical Mask.

Save Phace had some essential questions that needed to be answered, such as what type of plastic is best suited for this application, how will the resin perform in the real world, and of course the ever-important question, how much will it cost.

Solution

CPC Plastics, Inc. commissioned a comprehensive Material Selection Study, which included 3D Simulated Computer FEA (Finite Element Analysis), and conducted comprehensive on-site testing of the subject Save Phace Tactical Mask in accordance with applicable ASTM standards.

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Based on our research, knowledge, and expertise working on similar applications manufactured from comparable plastics, CPC researched and identified several grades of plastic resin(s) belonging to the PP (Polypropylene) and ABS (Acrylic Butadiene Styrene) families, which satisfied our preliminary requirements for meeting or exceeding the aforementioned ASTM Standards[1].

Once identified, CPC compiled these materials in a list that effectively ranked them from “most probable” to “least probable” and subsequently determined that a GE Cycolac ABS MG-29, Polylac ABS PA-709, or equivalent would meet the aforementioned Save Phace Tactical Mask product requirements.

Our Analysis of these plaques included first, creating a SolidWorks model of each of the two plaques, using the true dimensions of the subject plaques. We then created a SolidWorks model of the paintball, using true weight, volume, and mass. Following the creation of these individual part files, we then created two (2) individual SolidWorks Assembly files, one for each plaque material, in order to facilitate COSMOS Stress Testing.

The Stress Test(s) conducted on the plaque(s) required us to first, simulate the impact of the paintball, which was traveling at 4800in/sec (400ft/sec) and striking the center of the plaque. Stress Analysis occurs after this impact and measures stress concentration, distribution, and displacement of the subject plaque. Both of the subject plaques were capable of distributing and displacing the stresses following impact of the paintball, and therefore stress concentrations were negligible. Furthermore, while each of these plaques faired exceptionally well in simulated Stress Analysis, the Chi Mea material performed slightly better, in way of distributing and displacing the stresses ensuing impact.

Result

Following a detailed examination of the data, gathered during both our simulated Stress Analysis and subsequent Real World impact studies, we determined that both

[1] ASTM 1776-01.pdf

the GE Cycolac and Chi Mae Polylac plastic resins, identified as part of our Material Selection Study, satisfy the required mechanical requirements as per the ASTM standards, COSMOS Stress Analysis, and Real World Test Analysis.

If you would like the experience of plastic experts that have the technical knowledge and real world experience of working on all-encompassing projects, "call on the experts that those within the industry turn to with their toughest problems" ™, **Toll Free: 866.828.0820.**

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