



To Find out the Feasibility of Ethylene-Tetra-Fluoro-Ethylene (ETFE) in Inflatable Pillow System (IPS) to be Used for Building Facades

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ABSTRACT: The increasing energy demand, there have been many research done related with the conservation of energy used in buildings. The systems and materials used in buildings have an important role in consumption of energy. It is been always expected from the building envelope much more than just a skin, building envelope can help to get more efficient environments in terms of quality and energy. Building envelope, which separates indoor and outdoor, altered in the parallel of development on new material and technology. In recent years the technology of producing flexible ETFE films has progressed significantly allowing the production of thin membranes that are stable, durable and can be easily joined. This has given designers a serious alternative to glass for many applications.

This study aims to study construction system; ETFE foil pillow system, which is also known as, Inflatable Pillow System made of ETFE Foil. In the scope of the study, pneumatic pillow system investigated in detail and its performance evaluated on Environmental aspect, Technical aspects, Thermal Behavior (Ecotect analysis), Acoustic performance, Safety, Cleaning, Maintenance etc., which can be compared with other conventional Doubly Glazing Unit (DGU). The results are evaluated with the information gained. The advantages and disadvantages of the system as a glazing are discussed.

Keywords: Inflatable Pillow System, Conservation of energy, Pneumatic membrane, Glazing, ETFE foil, Glass, Doubly Glazed Unit (DGU), Building envelope.

I. INTRODUCTION

New discoveries in polymers, changing trends and rising demand in aesthetics of the building has forced designers to explore new materials. Building envelope, which separates indoor and outdoor, altered in the parallel of development on new material and technology. It is been always expected from the building envelope much more than just a skin, building envelope can help to get more efficient environments in terms of quality and energy. The present study aims to determine Inflatable Pillow System (IPS), which is a new generation construction technique as a building envelope for Pune, Maharashtra, India.

1. WHY ETFE?

Thermoplastic polymers other than ETFE, such as polycarbonates including poly ethyl methacrylate (Plexiglas) and polystyrene or fluorocarbons including polytetrafluoroethylene (PTFE) and polyethylene (PE) have been examined and found unsuitable as a replacement to glazing. (Callister *et al.*, 2011); (Minamisawa *et al.*, 2007) Such alternatives have been rejected as they fail to offer a combination of good

visual performance, energy transmittance and as an adequate engineering material performance (Baille *et al.*, 2006; Callister *et al.*, 2011). ETFE (Ethylene Tetrafluoroethylene) and PTFE (Poly Tetrafluoroethylene) are most common textile materials are used in building construction industry. While ETFE is predominantly applied as Inflated Pillow System (IPS), PTFE is normally used as building shading structure. (Stokes-1998, Robinson *et al.*-2001, G James - 2009, Macleod-2010)

Understanding ETFE : ETFE is a thermoplastic copolymer derived from the polymerization of the Ethylene and Tetrafluoroethylene monomers. ETFE can be extruded into large thin sheets, referred to as foils or films. Films are produced in thickness from 0.05mm to 0.3mm. Naturally ETFE films produced clear but can be modified to opaque.

Understanding IPS (Inflatable Pillow System): Inflatable Pillow System is (IPS) is designed for efficient use of ETFE as covering material. The system also can be used for other polymer materials similar to ETFE.