CUSTOMER BULLETIN 0710

A COMPARISON OF EXPANDED POLYSTYRENE (EPS) and EXTRUDED POLYSTYRENE INSULATION (XPS)

PURPOSE

This Customer Bulletin is the next in a series of white papers aimed at providing our clients, engineers, contractors, fabricators, and friends with objective information on our products and those of our competitors. A surprisingly large number of potential buyers of polystyrene-based rigid foam insulation know very little about the differences between expanded polystyrene (EPS) and extruded polystyrene (XPS). Some may even think they're the same thing. The fact is that the differences are considerable.

EPS BACKGROUND

EPS and XPS are both rigid, thermoplastic foam materials. EPS is produced from solid beads of polystyrene. Expansion is achieved by virtue of small amounts of gas contained within the polystyrene bead. The gas expands when heat in the form of steam is applied, thus forming the cells of EPS. These cells occupy approximately 40 times the volume of the original polystyrene bead. The large EPS blocks beads can be fabricated per specification to form insulation boards, blocks or customized shapes for the building insulation or packaging industries.

XPS BACKGROUND

XPS foam begins with solid polystyrene crystals. The crystals, along with special additives and a blowing agent, are fed into an extruder. Within the extruder the mixture is combined and melted under controlled conditions of high temperature and pressure into a viscous plastic fluid. The hot, thick liquid is then forced in a continuous process through a die. As it emerges from the die it expands to a foam, is shaped, cooled, and trimmed to dimension. Dow facilities continue to manufacture the only “billet” XPS process that can be shaped into pipe insulation, but ITW is the exclusive distributor.

R-VALUE COMPARISONS

Prior to prohibitions against CFC and HCFC blowing agents, XPS was claimed to outperform EPS in thermal insulating value. The situation is now reversed, with 1.8 lb/ft³ density EPS having an aged R-Value of 4.35 versus XPS billets at 3.84. Note, however, that some XPS sheet suppliers continue to claim R-Values of 5.0. We caution clients to compare advertised properties against third-party tests results - - while also considering test versus actual conditions. Declared moisture vapor permeance of XPS is also often claimed as 1.5 vs. 3 perm-in for EPS, yet a proper vapor barrier can be a much more cost-effective mitigator any very minor loss of performance. The R-factor of EPS remains constant over the life of the product because the EPS manufacturing process uses normal air rather than fluorine or hydrocarbon-based gas as blowing agents within the cells of the product.

BLOCK SIZE COMPARISON

XPS is extruded into smaller blocks of finite dimension, which may require gluing multiple billets together to achieve the necessary size. EPS is manufactured in much larger blocks that are subsequently cut by hot-wire machines into virtually any special shape or sheet by computer-driven systems. EPS is also easily worked in the field during installation.

LIFE CYCLE ANALYSIS

Although manufacturers of XPS and EPS often tout the fact that their products can be recycled, a complete life cycle analysis shows that EPS has a better overall environmental impact when compared to XPS. EPS can be recycled in many ways once it comes to the end of its life. These include recycling directly into new building products and incineration to recover its inherent energy content. The choice of a recycling method is based on technical, environmental and economic considerations.

COLORS

Finally, XPS in billets or sheets is often branded by manufacturers by using colored dyes such as blue or pink. EPS is white. Since XPS is typically more expensive that EPS, and since XPS thermal insulating performance is worse, XPS is being used less and less.