

The background of the top half of the page is a photograph of a white eSynergy Recycling truck. The truck's side is visible, featuring the company logo and the text 'eSynergy' in large letters, with 'responsible solutions' written vertically below it. The word 'PREMIUM' is also visible on the side panel. The truck is parked, and the background shows a building under construction or demolition.

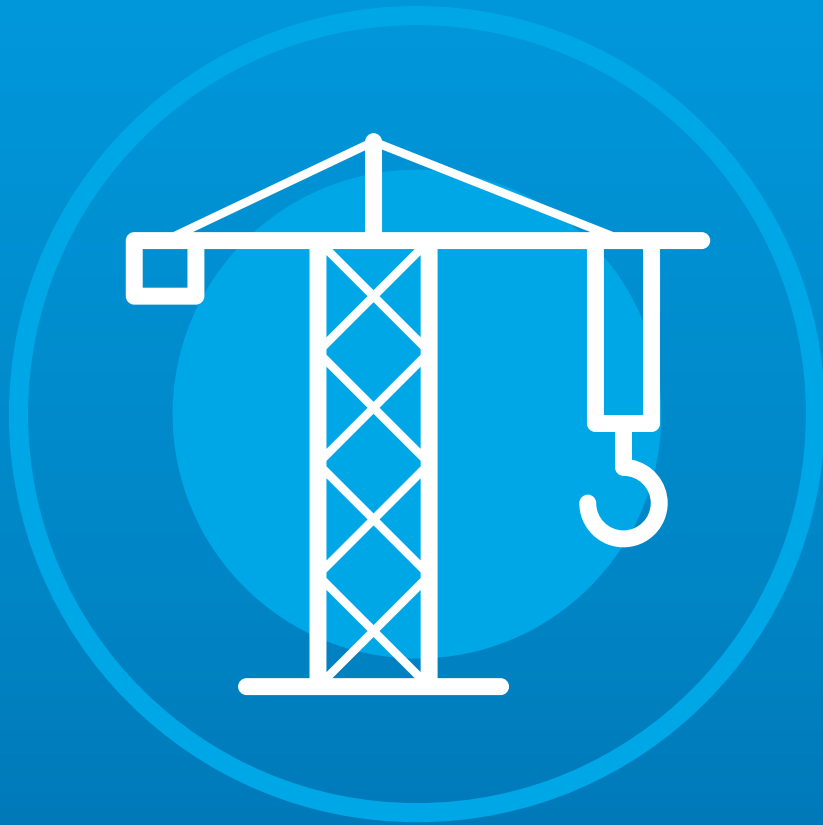
**eSynergy**  
Recycling

## **EXPERTS IN RECYCLING**

*Using technologies that safely  
preserve our environment*

## **Construction & Demolition Waste**

*Composite Insulated Panels*



# Construction & Demolition Waste

**SAFE, COMPLIANT, EMISSIONS-CONTROLLED DISPOSAL  
OF COMPOSITE INSULATED PANELS FROM THE  
CONSTRUCTION INDUSTRY**

## **COMPOSITE INSULATED PANELS**

Panels of this type are used primarily in buildings, cold room installations (food, pharmaceuticals and data rooms) and refrigerated display equipment.

The element which most affects the end of life disposal route for such panels is the blowing agent (solvent gas) used to expand the foam into the cavity between the sheet metal. This creates a closed cell structure in the polymer, trapping these gases which have desirable thermal properties.

***COMPOSITE INSULATED/SANDWICH  
FOAM PANEL RECYCLING***

# FLAMMABLE BLOWING AGENT (PENTANE) AND CFC RECOVERY

## Manufacturing

Panels are generally produced through a continuous laminating process consisting of a 'core' of thermally efficient insulant bonded between 'pre-stressed' galvanised steel sheet.

## Insulating Foam Types

### Polyurethane (PUR) & Polyisocyanurate (PIR)

PUR/PIR are the most efficient and commonly used core materials for insulated panels, used in over 90% of all panels.

The first panels manufactured were produced using CFCs as the blowing agent. These gases are now known to deplete the ozone layer. Low levels of stratospheric ozone is damaging to biology including increased levels of cancer.

From the mid 1980s the insulating panel industry gradually moved from CFCs to HCFCs. These blowing agents reduced the ozone depleting potential by 90% but are still classed as ozone depleting substances (ODS). From 2000 the industry gradually moved to hydrocarbons (HCs) or hydrofluorocarbons (HFCs). Due to the high global warming potential of HFCs (up to 14000 times that of CO<sub>2</sub>) these were phased out of use by 2004.

The most commonly used hydrocarbon blowing agent is cyclopentane (pentane). As with many hydrocarbons, pentane is highly flammable and explosive under certain conditions.

The UK Environment Agency and Health and Safety Executive are acutely concerned that pentane releases are appropriately monitored and properly controlled. 2013 saw the effective inclusion of pentane blown foams into the loss monitoring regimes of ODS treatment plants. These measures were promoted via the Environment Agency's report, 'Flammability of Fridge Insulation Foam Produced with a Hydrocarbon Blowing Agent'.

The report represents the Agency's current position on the fire and explosion risks of pentane blown insulation foam.

When shredding insulation foam containing pentane, the process must be 'intrinsically safe', as specified by BATRRT (Best Available Treatment Recovery and Recycling Technique). The term 'intrinsically safe' is widely used in regulation to describe the general requirements for the design of equipment used in explosive atmospheres or the likely presence of explosive atmospheres. Equipment must meet the standards contained in **I.S. EN60079- 1:2007**.

Processing plants permitted under the recently implemented Industrial Emissions Directive (IED) will be subject to conditions that require the release of pentane gas from treatment processes to be controlled and monitored.

## BULK COLLECTIONS FROM CONSTRUCTION AND DEMOLITION SITES



The requirement to comply with the IED has led to a significant increase in the emissions abatement and loss-monitoring obligations on sites that undertake the crushing and shredding of this form of hazardous waste.

Producers and operators risk prosecution under sections 33 – 34 of the Environmental Protection Act 1990 if they consign ODS or pentane blown foam panels for processing as non-hazardous waste due to (a) the potential risk of ODS to atmosphere or (b) the explosive hazard in the conventional shredding of pentane blown panels. Those involved in the disposal of composite insulated panels should adopt the precautionary principle when consigning them.

### **eSynergy CIP Facility**

The eSynergy CIP plant is fed using a unique loading system designed to elevate entire panels or commercial fridge carcasses to a height of six meters into an inerted chamber before being injected into the shredding chamber. The system is hydraulically powered and represents the first practical solution to the encapsulated recycling of building/cold room panels and commercial refrigeration equipment containing hazardous substances.

All shredding of insulation foam takes place within an inert environment by means of streams of gaseous nitrogen from the cryogenic plant and liquid nitrogen vaporisers. Inertisation is

increased on demand depending on either the oxygen level or a limit of explosive gases present in the shredding chamber, monitored at points of potential ignition. Automatic shutdown occurs when oxygen levels exceed 4% or 25% of the lower explosion limit of pentane. Following the implementation of the Industrial Emissions Directive in 2015, pentane emissions must be prevented by way of appropriate abatement. eSynergy uses an activated carbon adsorption technology to filter pentane from exhaust emissions.

The plant has a processing capacity of 16 tonnes per hour and treats the associated process gases to a purity within the 150mg/m<sup>3</sup> imposed by EU law. Liberated pentane-blown foam still contains gas inside the closed cell foam at this point. This material stream is directed to the eSynergy energy from waste plant (pyrolysis) to utilise the calorific value of the material in other on-site processes and to achieve a massive reduction in volume

eSynergy is the first UK operator to be permitted for the destruction of composite insulated panels under the newly implemented provisions of the Industrial Emissions Directive.

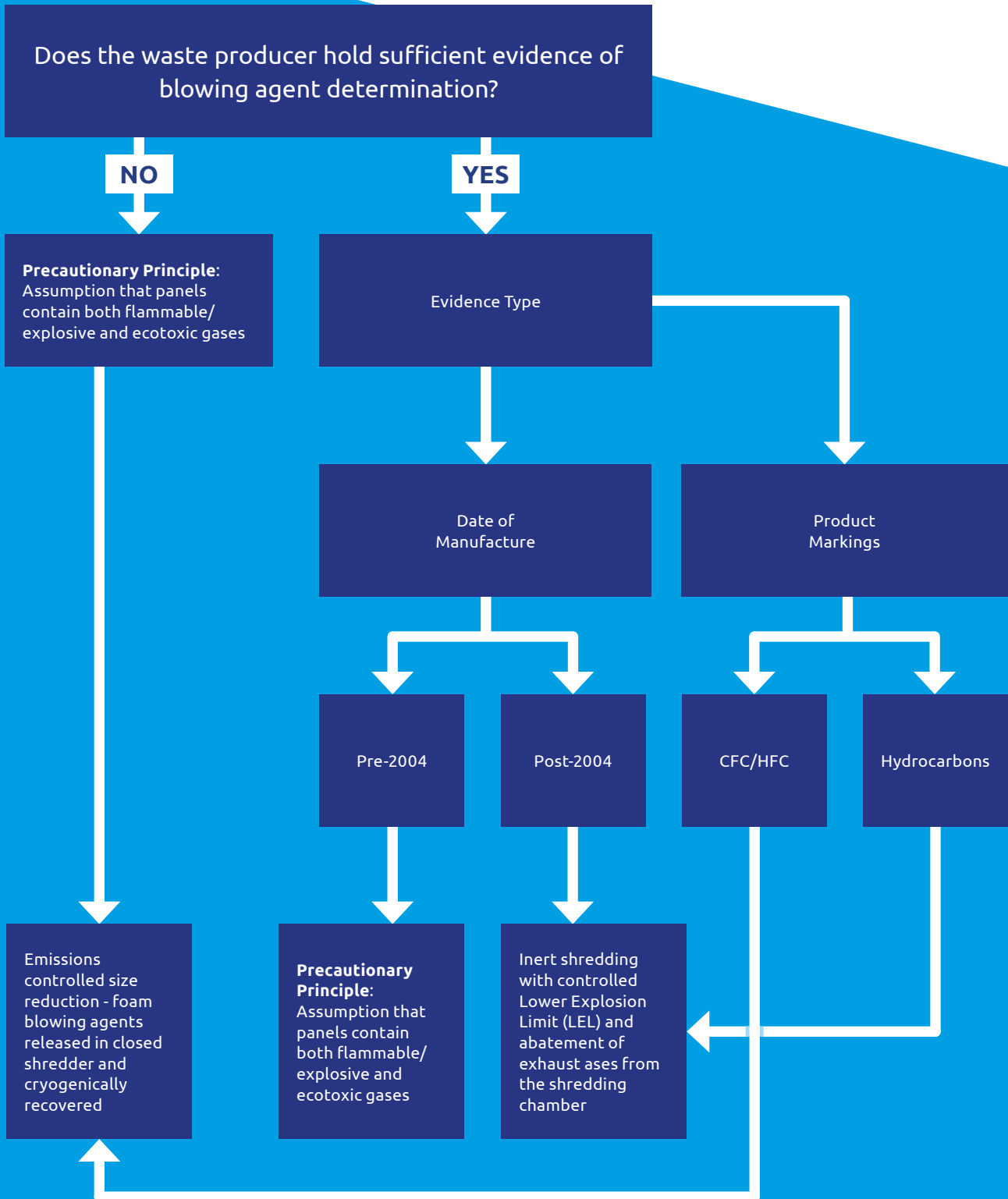


**SAFE AND COMPLIANT  
HANDLING AND RECYCLING**



# COMPOSITE INSULATED PANELS PRE-ACCEPTANCE PROTOCOL

Approved by the UK Environment Agency as best practice



## **Our Recycling Mission**

*To deliver safe, clean and environmentally responsible waste treatment technology and recycling services for difficult hazardous wastes*

### **Experts**

Experts in recycling, we are committed to the protection of our environment, driven by a desire to preserve through innovation. We take great pride in our people and our innovative technologies. Continual improvement of all our recycling processes and our employee training is at the core of our corporate ethos.

### **Commitment and Responsibility**

Our commitment to provide the best possible service to our customers has led us to the development of innovative technologies that ensure the highest quality of service at the best available price on the market.

We are working tirelessly to deliver a reliable and safe service by cultivating a healthy and safe working and living environment for our employees and the public. Our devotion to providing outstanding services to our customers inspires us to constantly and continuously perfect our routines; improve our practices and take responsibility for our work from beginning to end.

### **Innovation**

eSynergy Recycling provides solutions for some of the most difficult hazardous wastes by using cutting-edge technologies. Proving synergies and pushing the growth of the circular economy is the key to the realisation of many government targets for collection, treatment and recycling of these wastes. eSynergy Recycling is the only UK recycler with the capability to thermally convert non-recyclable residues on site, converting them into heat and power.

### **eSynergy Recycling Difference**

eSynergy combines the large scale shredding and material separation of a metals fragging facility with the high temperature thermal and cryogenic technologies of a specialist hazardous waste treatment plant, to provide a safe, compliant and environmentally friendly solution for difficult high volume waste streams that contain hazardous substances such as construction panels or commercial refrigeration equipment containing CFCs (Chlorofluorocarbons) and flammable hydrocarbons (pentane).

**Our unique economies of scale allow us to provide our services at exceptionally low cost, and, using our fleet of dedicated specialist vehicles, we are able to offer the most competitive and convenient service on the market.**

*As a leading solutions provider we must continually assess the newest emerging technologies, both mechanical and thermal, to ensure that our clients are receiving the very highest recovery standards for their waste.*

**Sean Allinson-Bulman**  
Chief Executive

*Pyrolysis provides an economic and effective energy recovery process for a wide range of materials, recovering up to 80% of the energy value of the waste fuel as usable heat and power, and operates to the highest environmental standards.*

**Professor John Sharpe**

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