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Title –

Azodicarbonamide Foaming Agent – Recent inclusion to the REACH Candidate List of Substances of Very High Concern (SVHC) - The Potential Impact on Industry, Market and Consumer

British Plastics Federation / West and Senior Presentation 23rd May, 2013 –

Further to a series of discussions between the British Plastics Federation (BPF) and West and Senior Limited (WSL), a presentation to Industry was made on the 23rd May, 2013. The BPF kindly organised and hosted the event where West and Senior presented information regarding Azodicarbonamide and the current investigation being evaluated by the European Chemicals Agency (ECHA).

Executive Summary –

Azodicarbonamide is recognised as the key chemical foaming agent for use in cellular thermoplastic and rubber applications on a Global scale. In Europe this material is used as a base technology for foaming in circa 80% of cellular thermoplastic and rubber applications and is the core technology in the foaming of PVC, Polyethylene, Polypropylene, EVA, numerous rubber applications and polymer recycling.

The foamed articles produced have found favour across many market sectors and the foam technology brings many benefits to society including environmental gain, improved thermal insulation, acoustic insulation and crash protection to name but a few.

In December 2012, under a program of review, the European Chemicals Agency (ECHA) announced that the chemical was to be included in their Candidate List of Substances of Very High Concern under Articles 57 and 59 of Reach Regulation (EC) 1907/2006. This listing will now initiate a further examination of this technology and may result in future restrictions on usage, or negative reception across market sectors.

West and Senior have been importing, modifying and selling technology based upon Azodicarbonamide since the 1980's and have a dedicated team and manufacturing department further developing and handling this chemistry.

This document will discuss and review the potential impact upon European Industry and will detail the following areas associated with this technology and how continued use may be defended.

- What is a Foaming Agent
- Why Azodicarbonamide
- The fundamental basis of manufacture and technology
- The Market Sectors and Applications
- Global Market and Manufacturing Base
- Reach / ECHA – their role in the polymer industry
- Background argumentation which prompted the listing
- Is there genuine safety risk and is the risk managed
- Initial feedback and common misconceptions
- Azodicarbonamide and European Restriction – are we already part way there
- The next steps and timescales of assessment
- Can Azodicarbonamide be replaced by an alternative
- What are the implications if restricted to foaming and associated materials
- What has been done and what can be done to defend for continued use

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This technology is key across many sectors and whilst its addition level may be small, the removal may simply be the difference between being able to foam or not. The secondary implications are far reaching if this chemistry is restricted but a worthwhile defence may yet be made.

Content

Section 1	What is a Chemical Foaming Agent and what is Azodicarbonamide?
Section 2	European Chemicals Agency and Azodicarbonamide
Section 3	Common Misconceptions
Section 4	Timelines and Options
Section 5	Implications of Failure
Section 6	Next Steps
Section 7	Closing Comments

*Appendix (end of document) – West and Senior / Information Collation

DETAILED CONTENT –

Section 1 – what is a chemical foaming agent and what is Azodicarbonamide?

A chemical foaming agent is an additive which is commonly found within the field of polymer processing. They differ from many classes of additive in that when processed at an elevated temperature they purposely decompose and on doing so release a gas /gases which may be trapped within the polymer matrix to create a cellular or foamed structure.

The use of chemical foaming agents is not new and has become an established technology which has seen continual growth for many years due to the technical, environmental and commercial enhancements that can be found when adopting this technology.

Many consider the key role of a foaming agent is to reduce weight however many associated benefits may be found with key considerations being applicable dependent upon final application. Such benefits may include –

- | | |
|--------------------------------------|---|
| ❖ Easier Handling | Reduced transport costs, ease of installation |
| ❖ Reduced Polymer Requirement | Less cost, environmental gain, possible reduced taxation |
| ❖ Improved Product Dimensions | Increased volume, thickness and rigidity. Anti-sink in moulding |
| ❖ Improved Insulation | Sound deadening and reduced thermal loss/transfer |
| ❖ Cushioning | Shock absorption, cushioning and crash protection |
| ❖ Design Aesthetics | Three dimensional surface detailing |
| ❖ Aquatic | The product may float, improved buoyancy for improved safety |



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It should be considered that there are a number of possible chemicals which may be used as a chemical foaming agent including;

- Azodicarbonamide (ADCA)*
- Sodium Bicarbonate (SBC)
- 4'-4', Oxybis Benzene Sulphonyl Hydrazide (OBSH)
- Toluene Sulphonyl Hydrazide (TSH)
- P-Toluene Sulphonyl Semicarbazide (PTSS)
- 5-Phenyl Tetrazole (5-PT)

*ADCA is the abbreviation used by ECHA within their documents.

Each chemistry will be used for a specific property and each grade has found applications where they excel. Key properties which that influence choice may include; decomposition point, gas yield, colour, food contact approval, price etc.

Additional technologies are also considered as chemical foaming agents however these have not been listed as their use is in decline across Europe due to associated risks in handling or limited availability.

If we therefore consider Azodicarbonamide (ADCA) in more detail, this is a chemical foaming agent which provides a unique blend of properties suitable for polymer foaming.

The decomposition path is exothermic, increasing temperature as the reaction proceeds and this helps auto-catalyse the thermal reaction promoting optimum gas yield.

The chemical offers a high gas yield per unit of material circa 240ml/g compared to for example Sodium Bicarbonate being circa 150ml/g and this helps minimise usage and reduce possible influence on other aspects of the formulation.

The decomposition point, when measured by Differential Scanning Calorimetry is circa 230°C but this can reduced to circa 140°C through combination with catalyst ingredients. This level of modification and flexibility to fine tune the reaction is not found, or not found to this level, with other foaming chemistry. As well as broadening the process window, this technology also permits the reaction rate to be controlled through combination with inhibitors which slow the influence of the catalysts used. This can in turn allow the formation of three dimensional designs to be created in the final application.

Azodicarbonamide also combines synergistically with other chemical foaming agent types allowing further control of processing behaviour or commercial costs.

In its most simple equation, the decomposition path undergone by Azodicarbonamide when subjected to elevated temperature is as follows (*note, there are several pathways the decomposition may take depending upon additional ingredients, moisture or if tested dry or in a liquid phase*) –



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The principle gas released is Nitrogen. This offers its own strengths to the development of the foam structure as Nitrogen is considered a self-nucleating gas. The solubility and diffusion parameters of the gas enable a slow controlled formation of the cells promoting a fine, consistent and uniform cell structure. This allows control of cell formation which in turn benefits the control of density, expansion thickness, surface finish, mechanical performance and reduced risk of cell collapse. As diffusion rate is also very slow, the gases may be trapped in low pressure process operations such as spread coating and rotational moulding which are areas where gas entrapment suffers when other gases are formed.

The combination of the factors listed above, are some of the main reasons that have helped Azodicarbonamide become a key chemical in the foaming of polymers. The use of this chemical is not new and was initially used in polymeric foaming in the 1940's. Application development grew during the 50's but it was during the 60's and 70's where the technology found favour as the use of polymers grew across many of household items. Today, Azodicarbonamide can be found either as the sole foaming agent or as a building block of the foaming system across circa 80% of foamed thermoplastic and rubber articles we find in our day to day lives across Europe and the America's.

Applications include –



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EU Business



EU Business



Azodicarbonamide is used as in many cases it offers the best technical and commercial performance –

It will be extremely difficult to replace using current technology!

Azodicarbonamide manufacturing capacity has increased over the last 20 years to accommodate the growing demand around the Globe. There are two major process routes to create Azodicarbonamide and these are considered as the Hydrazine Hydrate and Urea paths, both of which are key raw materials during the production phase. Feed-stocks are not free from their own issues and this must be considered as pressure is

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required at the base chemistry manufacturing level to stimulate interest in continued supply. Hydrazine Hydrate is used in many applications and this includes crop protection, whilst Urea is used in fertilizer production. As a consequence both raw materials are drawn towards the farming community and away from the chemical industry associated to polymers.

Global capacity of Azodicarbonamide is circa 200,000tonne per annum but the term Global is somewhat misleading in today's supply chain. Europe has witnessed the closure of base Azodicarbonamide manufacture and recent announcements have also been made relating to closure of a key production plant in the USA. The World has become reliant on Asian manufacture for this material, with China accounting for circa 70% of manufacturing capacity, whilst long standing production also exists across India, Indonesia, Japan, South Korea and Taiwan.

This reliance on Asia must be considered as there is no European basis of manufacture to defend for continued use. Asian producers are currently considering the potential implications of REACH. In selected cases, it has been reported that one option of consideration includes withdrawing supply, rather than applying for continued use as demand continues to strengthen locally and in South America. Should this occur, the volume capacity potential that may be approved for European supply could fall, squeezing supply routes and availability. For this reason we are in discussion to promote Europe as a long term market with a demand for Azodicarbonamide volumes.

Section 2 – European Chemicals Agency and Azodicarbonamide

If we consider ECHA, we must respect and acknowledge the process that now controls our futures and the options that can be created to meet the needs of the industrial and consumer markets we supply. ECHA are the European Chemicals Agency and this organisation is responsible for the process of REACH. REACH in turn is a system created for the Registration Evaluation and Authorisation of Chemicals entering the European Union. The system was introduced to protect industrial users and consumers from harmful chemicals and to identify materials of issue, they created a list of Substances of Very High Concern, known also as the SVHC listing. Should a material be identified and included within this List, future restrictions upon usage and importation may be applied. In the most severe case this may result in a complete ban on usage thus eliminating the potential risk from European Union residents.

Products identified as SVHC's have traditionally been listed due to their toxic, bio-accumulative or carcinogenic properties. In the last two years the options for consideration have been re-evaluated and an additional option of Respiratory Sensitizer was also introduced. Whilst 'sensitizer' may not be a recognised term amongst the general public, clearly the words toxic and carcinogen are and the association to such materials is of concern regarding defence at consumer level where higher levels of misunderstanding may be possible.

In order to identify possible materials for inclusion to this list, ECHA examine industry and also ask Member States to identify possible substances of concern. Early in 2012, the Austrian Environment Agency requested the possibility of examining Azodicarbonamide as a Respiratory Sensitizer, classifying it as a material of equivalent concern under Article 57 of REACH. Industry was not made aware of the investigation and subsequently the Austrian agency submitted a 53 page document to ECHA as evidence to classify Azodicarbonamide as a potential candidate. This document is termed as the Annex XV Document.

ECHA released this document on the 3rd September, 2012 and requested comment from interested parties. A six week deadline was permitted for response (18th October, 2012). On examining the document, a high level of data has been collated targeting Azodicarbonamide and listing several historical cases of respiratory sensitization. In many cases the data is historic with most findings being listed from the 1980's and 1990's - prior to many of today's improved health and safety controls. Of concern regarding defence, within the



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document are listings of potential alternative foaming systems. These include a range of options including mechanical foaming and gas injection together with a list of other foaming chemistries as those found earlier in this report. The concern is that reference is made to these being suitable alternatives to Azodicarbonamide, hence questioning the need for continued use. It should also be noted that the products use in Polymeric Foaming is identified as the key volume area of application - as such it is the key target for reduced/restricted usage.

As the document was released upon the ECHA website, to many the listing went unnoticed. West and Senior responded to ECHA on the 1st October in shock at the proposal and in defence of continued use. Our customer base was informed and discussions started within the supply chain, which also identified a level of defence being raised from across Europe and Asia.

Subsequent to the deadline, on the 13th December, 2012 a meeting was held by ECHA during which a motion was passed to accept the recommendation from Austria. On the 19th December, 2012 Azodicarbonamide was publicly included within the Candidate List of Substances of Very High Concern. Two further chemicals (both anhydride technology) have also been included under the classification as Respiratory Sensitizers.

ECHA have released data on the responses provided. From across Europe, 71 responses have been listed with the content of 53 responses having open access. From the 53, 9 were considered to be duplications and 9 further were deemed to be in support of the Austrian proposal. Of the 44 in disagreement with the proposal, the level of response varied from detailed questioning to short statements without supportive evidence. One Member State questioned the process of identification and several questions were raised as to the selection and medical data associated to the risk level being aimed at this chemical.

The level of questioning and defence of Azodicarbonamide also varied dependent upon geographical region with the bulk volume stemming from Germany, UK, France and Belgium. In many cases no response was made either for or against the motion and the current standing of several Member States is unknown.

Section 3 – Common Misconceptions

Upon return to business January 2013, information regarding this notice was being relayed across Europe and it became clear Industry in general was shocked at the decision and speed of inclusion to the Candidate List. On examining the adoption document, no restrictions or timescales are included, however we are aware that this may change and change quickly. It also became apparent on discussing the matter within the market place that there was a high level of misunderstanding, as in many cases only limited information had been obtained. To clarify these are some of the common misconceptions found –

ECHA released a press statement on the 19th December 2012 identifying and listing a further 54 chemicals to the Candidate List in the closing weeks of the year, which then brought the List to a total of 138 chemicals, thus achieving a target set of 136 for year end. Whilst considered purely as a political inclusion by many, this is not the case. Prior to the identification, circa 1,500 chemicals were considered by ECHA and individual Member States and as such Azodicarbonamide was already being short listed for discussion. ECHA have also announced a continued plan to identify further chemicals and the List will not end at this figure. A document has been released stating a strategy to examine further potential Candidates and this process is being termed as the Roadmap 2020. No target has been set, but resources are being considered to identify materials and examine Risk Management Options (RMO's) which may see this list increase to 440 chemicals by 2020. At present there is no evidence as to which chemicals may be selected over the coming years.

Reference to low European volumes has also been mentioned across Industry yet the European volume is approximately one third of Global demand. On considering other chemicals selected for inclusion to the List, a



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number are believed to be significantly lower in volume than Azodicarbonamide. In addition, the number of users is broad and therefore priority level is increased as users fall above the REACH band line of 100+ users. Statements have been made that use of masterbatch or dispersion removes any concern regarding listing. This is also incorrect as the supply format is not quoted in the classification. As a significant volume of use across Europe remains in powder form, ECHA view this chemical as being a high concern and it must also be considered that nearly all masterbatch and dispersion supply routes are found within the EU and as such implications apply upstream in the supply chain.

As usage is critical in many industrial sectors across Europe, it has been questioned if any restriction would be imposed that may harm industrial growth or continuity. In the initial round of questioning, only one Member State questioned the inclusion and classification of sensitizers. This Member State was the UK. Of the remaining 26 Member States, Governmental and Non-Government Organisations (NGO's) expressed support for the Austrian proposal. Support against Azodicarbonamide has been voiced from Belgium, Denmark, Germany and Sweden. It has also been identified that Holland and Norway have also voiced initial support to the proposal. It is currently unclear as to the viewpoints from other regions, however all but the UK voted for inclusion of Respiratory Sensitizers to be considered as SVHC's. The UK abstained from voting.

Whilst many examine their individual companies regarding safety, it is true to suggest there haven't been significant cases of sensitization to Azodicarbonamide in recent years. This does not discount Azodicarbonamide from consideration as the Listing is based upon intrinsic properties and this remains applicable. Azodicarbonamide has been listed upon Material Safety Data Sheets and packaging since the mid 1990's as being Harmful and carries the classification of R42 – may cause risk of sensitisation by inhalation.

There is strong evidence to show that if mishandled, this chemical may indeed lead to sensitisation which may show itself as Asthma like symptoms. The UK monitors industrial incidents via the SWORD database with this relating to 'Surveillance of Work Related and Occupational Respiratory Disease'. The Annex XV document submitted by Austria makes reference to this document and states 28 cases within the UK between 1989 and 2011 can be attributed to Azodicarbonamide. It should be considered that the vast majority of cases were prior to year 2000. ECHA have also made comment regarding the questioned use of historical data and the reduced level of occurrence in recent years. They suggest that one reason for reduction is the closure of European plants, but highlight the potential risk remains evident.

Austria has promoted the use of alternative chemistry and it has been discussed that Azodicarbonamide offers a unique blend of technical characteristics that have witnessed its use across such a broad spectrum of application, polymer and process type. The argumentation that these chemicals are not suitable alternatives has not yet been accepted by ECHA and we cannot rely on a statement such as 'there is no alternative' to convince them accordingly. Annex XV lists the following chemicals as viable chemical options –

- Oxybis(Benzene Sulphonyl Hydrazide)
- Toluene Sulphonyl Hydrazide
- P-Toluene Sulphonyl Semicarbazide
- 5-Phenyl Tetrazole
- Sodium Bicarbonate
- Sodium Bicarbonate/Citric Acid Mixtures



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Industry is aware that should one of the above chemicals prove itself as an alternative it would not do so without compromise. Such compromises or risk to use may include –

- Reduced gas yield leading to high volume addition requirements
- Incorrect process/decomposition temperature leading to poor foaming
- Increased hazard classification for handling and increased risk
- Residual odour in final articles proving unattractive to consumers
- Other potential safety concerns, for example high risk decomposition residues
- Gas type released during decomposition resulting in poor cell structure
- Inferior foam structure resulting in loss of physical properties

Irrespective of technical argumentation it has also been argued that Global manufacturing capacity may not exist for the other options stated should they be a suitable technical candidate. It has also been argued that Azodicarbonamide is not used purely on commercial grounds. If use was purely based on commercial cost, Sodium Bicarbonate would reign supreme, but this is not the case even though many have tried.

ECHA consider a much more basic option as a consideration - do we actually need to foam all applications? They also consider the process of REACH to be stimulus for new product development and invention that will help European business grow rather than being a process that will hinder supply.

Many would view Azodicarbonamide as being separate from many chemicals in that it decomposes during processing and therefore there is no risk to the end consumer and therefore non-applicable under REACH. Many also believe that when encapsulated in a polymer there is no free powder and hence there is no risk. At present these views cannot be deemed as suitable evidence.

Whilst Azodicarbonamide does decompose during processing, a residual level may remain. REACH dictates that a level greater than 0.1% must be declared and it has been reported that one Member State has identified random products, found within the marketplace, to contain levels above 0.1%. The fact any residue is encapsulated is not considered as safe. Questions remain as there is no defined Threshold level for Azodicarbonamide on what may be considered to cause onset of sensitization. The UK has, for a number of years, listed a Workplace Exposure Limit but a Threshold level of safety is not known and none has been agreed across the EU. As effects can vary person to person such a level may be difficult to identify and therefore the 0.1% concentration must be adopted. Concern has been raised with ECHA that users who are cutting, milling, sawing, recycling etc. foamed product containing residual Azodicarbonamide may breathe dust and become affected. The possibility of migration to the surface must also be considered unless evidence can be shown to remove this risk from the discussion.

West and Senior commissioned a study to examine the potential of residual Azodicarbonamide within a final product. To demonstrate the fact residual Azodicarbonamide may remain above 0.1% within a foamed article, a PVC plastisol was prepared to allow expansion and foaming to be determined against timed exposure to temperature. The PVC plastisol was a laboratory formula and contained 0.5% Azodicarbonamide with a target expansion factor of 2.

Samples were prepared of equal thickness and placed within a test oven set at 220°C. The plastisol began to fuse at circa 50 seconds and the first sample was removed at 60 seconds. The time was then extended for each subsequent sample by 20 seconds and a chart of foam thickness versus time was plotted.



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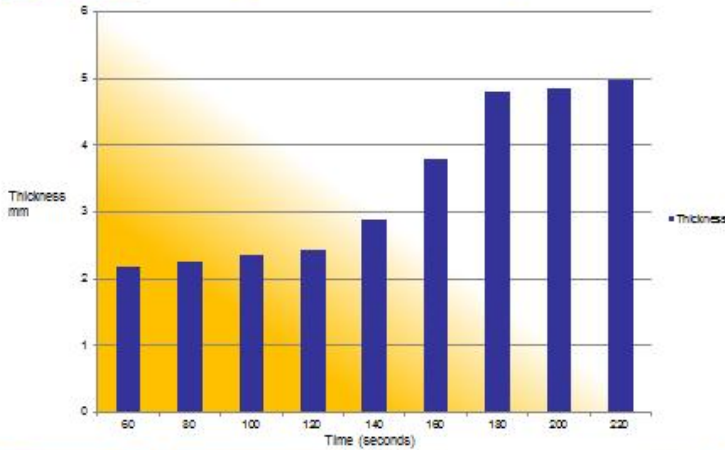
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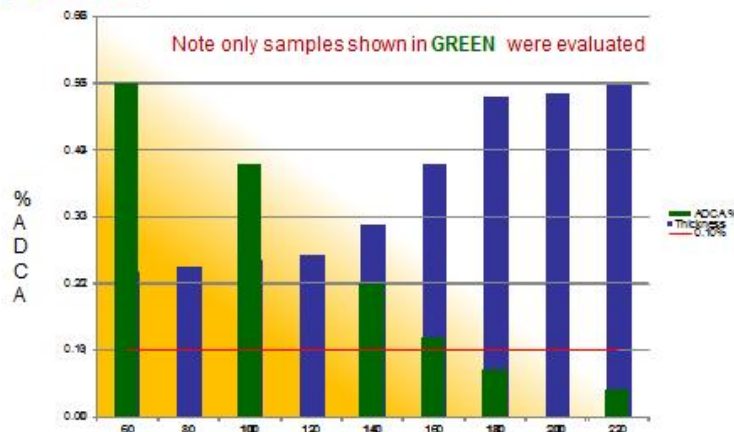
e.g. Plastisol Expansion



It can be seen that as time continues and the foaming agent begins to decompose, a foam structure allowing expansion develops. There is rapid expansion between 140 and 180 seconds before gas evolution rate slows as the foaming agent diminishes and the expansion plateaus. The yellow shading is for demonstration purposes but highlights that Azodicarbonamide, whilst yellow in nature, loses this yellowness during decomposition. It cannot however be used as a definitive guide as this can be readily masked by pigmentation. Samples from these expanded foam structures were then sent to an independent laboratory for evaluation and determination of residual Azodicarbonamide content. The polymer was removed by dissolving and the residual Azodicarbonamide was then extracted by a second solution process before being analysed by High Pressure Liquid Chromatography (HPLC). A chart was then compiled showing residual Azodicarbonamide level against applicable sample. Residual level is shown in percent (%). Samples shown in green relate to the samples evaluated. The red line indicates 0.1% cut off line.



Residual ADCA



It can be seen that as decomposition starts, Azodicarbonamide level begins to fall. It can also be seen however that at 160 seconds a clear level of foaming exists yet the level of residual Azodicarbonamide

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remains in excess of 0.1%. This foam process may have already been stopped at that level and would therefore be non-compliant.

The decomposition rate may be influenced by a number of factors including use of catalysts, time and temperature with reduced temperature greatly slowing the decomposition rate. In a number of applications the initial level may also be in excess of 0.5% and hence to ensure reduction below 0.1% is a larger step change.

We would therefore recommend confirmation rather than assumption of residual levels.

It has been highlighted that the USA permits the inclusion of Azodicarbonamide in the baking of bread and therefore it should be considered safe. REACH is a European regulation and the regulations of the USA do not apply within Europe. In the USA, it is correct Azodicarbonamide may be used within bread baking as a flour conditioning agent. This is controlled by the FDA under regulation CFR21 part 177.1210. and addition level is strictly limited to 45ppm.

Within the EU, Azodicarbonamide cannot be used as a food additive and cannot be used as a foaming agent in food contact applications, which includes packaging. This is controlled under EU Directive EC2004/1 which prevented use as a foaming agent in food contact applications from early 2005. The argumentation for this regulation stemmed from the fact semicarbazide is produced as a product of decomposition and trace levels may remain in the decomposition residues. Semicarbazide is considered a weak carcinogen and whilst this is not the key reason for the listing by Austria, it must be considered that it is known within the EU (and is also listed as a secondary argumentation in Annex XV) and that the stance is independent from other regulatory regions.

Across many regions we have found a somewhat relaxed attitude to the Listing with a belief that no actions will occur for a number of years and that the Industry has plenty of time. Much of this is based on the incorrect political belief for the Listing and also that other chemicals listed have been on the Candidate SVHC for a number of years. The speed that this motion was passed has surprised many and irrespective of legislation, unless sound argumentation is collated, customer pressure may dictate and then pressure for change ahead of legislation.

Section 4 – Timelines and Options

At present no timelines have been clarified regarding restrictions to use however a worst case scenario may be more upon us than many realise –

The next meeting by ECHA to review the Candidate SVHC List is scheduled for 20th June, 2013! ECHA may at this meeting decide to prioritise Azodicarbonamide for further review. A further public consultation would then follow and this is anticipated to last 3 months (over the summer holiday period)

ECHA will then consolidate their findings and make a recommendation to the Member State Committee in December 2013. A request to progress to Annex XIV is expected.

If the Member States accept the recommendation, a further consultation period and review by the Member States will follow early 2014, with a conclusion being determined September 2014.

At this point the Member States may vote to list Azodicarbonamide as a SVHC and a Sunset Date may be applied. The Sunset Date is a date from which Azodicarbonamide or products containing more than 0.1% cannot be imported, used or sold within the EU.

The Sunset Date may apply from late 2017.



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PIGMENT AND ADDITIVES TO THE POLYMER AND ALLIED INDUSTRIES

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Should this occur there will be immense pressure from the market to remove Azodicarbonamide from the supply chain and as no direct alternative exists, development time will be extremely short and potentially complex.

All however is not lost and it may be possible to prevent the sun setting on Azodicarbonamide. As an Industry it may be possible to prevent or slow the sun setting as options still exist and any restriction is not a forgone conclusion.



ECHA and Industry may push for progression across a number of routes. These may include the following options –

Option A

20th June 2012 – As ECHA cannot review the full Candidate List in 2013 due to resource levels, they may decide Azodicarbonamide is a low priority and no immediate review will be prompted. This would delay any review for 12 months until the next review in June 2014. This may then repeat for up to 5 years although this is considered unlikely at this time.

ECHA may also consider Azodicarbonamide as a priority but are then swayed by Industry response and recommend to the Member States not to progress to any restrictions. The material will remain on the Candidate SVHC List but no usage restrictions will be applied. At present ECHA have no plans to remove chemicals from the Listing as they also envisage the Listing to be a reminder to Industry to follow best practice regarding risk management control.



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This swaying of any decision is the best possible outcome for Industry as production and supply will continue unaffected (unless dictated by the market). To target this Option, Industry must prepare a strong defence in readiness for the initial public consultation period. Lobbying in advance of any consultation (if the prioritisation is delayed) is also being considered however this will be impossible before the 20th June, 2013.

Option B – Annex XVII Restriction

It may be possible to lobby ECHA and propose that use is restricted in selected applications only. Annex XV also lists further uses of Azodicarbonamide outside of Polymeric Foaming. Use as a construction chemical and in air fresheners is also listed. It may be possible to promote that these applications will not be defended against and that restriction in these areas will be a sufficient reduction in European volume to reduce exposure risk.

On discussion with numerous Azodicarbonamide manufacturers, it has not been possible to clarify these application areas let alone percentage volumes applied. It is believed they may have been listed in error however it cannot be clarified by ECHA which company has listed these applications on grounds of confidentiality.

Due to this level of uncertainty regarding use and volume share, the path of Restriction through Annex XVII is not considered a viable option. Any restriction would follow a similar timeline and be applicable from late 2017 if prioritised from June 2013.

Option C – Annex XIV with EXEMPTION

Exemption allows continued use in very specific applications where strong historical data exists.

This we would deem unlikely to achieve as any use in application is extremely specific. There is an advantage in that there is no timeframe for change however this must be backed by extremely strong evidence that supports imposing minimum level requirements relating to the protection of human health or the environment.

An example of EXEMPTION is the continued use of Di Octyl Phthalate (DOP) plasticizer in PVC blood bags.

Option D – Annex XIV - Authorisation with extended Sunset Dates

Authorisation allows continued use for specified applications where continued use is extended beyond the Sunset Date. This extension is reviewed periodically with timing dependent upon the submitted application dossier. Reviews are expected in steps of 3 to 5 year terms from point of acceptance.

For the chemicals currently ahead of Azodicarbonamide in timing, no formal application for Authorisation has yet processed through this system of control and as such outcome is unknown. This is however considered at this time, as being the most realistic path should any restriction be promoted by the Member States.

Due to the broad range of application use it is not believed that polymeric foaming as a generic term will be approved and that a more detailed listing of application will be required. It is then anticipated the applications with the greatest levels of defence support are more likely to succeed.

West and Senior are aware of selected pigments which are close to running through this process and an application of Authorised use is due for submission. Their application basis is broad and this will become a good guide as the process develops through early 2014.



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Whilst the Authorisation process is currently believed the most suitable option of continued use should restriction progress, the process will require a high level of support data to justify any extension.

- This includes evidence of product benefits to social, economic and environmental gain
- Strong control of risk management for users must be proven
- Strong control of risk management to consumer must be proven
- Specified supply chains will be determined
- Specified applications will be determined
- Volume sacrifice may be required
- Evidence regarding control of production process will be required
- A development plan for reduced volume/phased removal will be required

To use material under Authorisation a company must conform to one of the following –

- ✓ Have their own Individual Authorisation
- ✓ Use a supplier who has Authorisation with your application listed
- ✓ Have an application which is Authorised with your company named in respect to the application
- ✓ Have a customer who is Authorised and lists you as a supplier who they have declared in their Authorisation dossier
- You cannot claim approval simply because another Authorised supplier or competitor is in the same market area your company

Option E – Use of Chemical Alternatives

To simply replace Azodicarbonamide by different chemistry will be extremely difficult (if possible) without accepting compromise regarding.....

- Technical Performance
- Efficiency
- Cost

A foaming agent reformulation may be possible given selected material and process combinations although this may also require reformulation of the base polymer matrix. Any development path may prove rocky with a number of detours along the route and conventional thinking will need reconsidering as there are no 'off the shelf' options currently available.

Industry may have to become creative in its approach as a singular chemistry may not cover all applications in the same manner as Azodicarbonamide. It may result that each application, process and even user may need consideration on a case by case basis.



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We must also consider an answer may not be found within the potential timeframes that may occur if restrictions apply. This is a clear concern for many users.

Due to the potential of further chemicals being added to the Candidate List, Industry must remain wary that any route taken is viable given production capacity/availability and any possible future restrictions –

We must not jump out of the frying and into the fire!

TIMELINE SUMMARY

If ECHA prioritise Azodicarbonamide for review in June 2013 and this process continues, the key timelines for defence are as follows –

June 2013 – ECHA Prioritise Azodicarbonamide

Industry will have a 3month consultation period to submit defence data to a focussed location.

December 2013 – ECHA recommend to Member State Committee to progress for restricted use

Industry will have a further consultation period to defend for continued use.

This will be less focussed as individual Member States will require convincing prior to any vote.

September 2014 - Member States recommend restrictions to use

Industry will have an 18month period to submit an application for Authorised use. If an application is made after the 18month period, even if a decision is pending, the company must comply with the Sunset Date criteria until (if) granted continued use.

As time continues, defence will be harder to achieve, become more costly and require greater emphasis on support data per application.

With respect to any defence option chosen, strong support data will be required and the collation of data needs to commence quickly to provide sufficient evidence. A consistent approach from Industry towards Authorities is required as conflicting data across Industry will hinder any progress if it is considered options exist beyond Azodicarbonamide. The target is to supply supportive evidence towards defence and it must be considered that we cannot contest the fact that Azodicarbonamide is a sensitizer although it may be possible to suggest a Threshold limit is identified, below which no risk exists.

Please also consider that present decisions are being made based on historical data and the Annex XV document submitted by Austria. Our aim is to make aware and inform Authorities as to the historical and current use of Azodicarbonamide and the many benefits it brings. The benefits of foaming can be shown (although specific, proven data is required) but it must also be shown that Azodicarbonamide creates a foam beyond the levels of listed alternatives.

The staff at ECHA and the Member States are highly educated, but probably not from the polymer industry. They have a process which must be followed and we must not confront them but inform them of our manufacturing limitations and product benefits we know and understand in great detail.



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Products foamed with Azodicarbonamide have many benefits which are considered positive towards the Socio, Economic and Environmental balance and whilst we see them every day, these must be promoted.

Key uses of foamed articles help in.....

- ✓ Increased volume of product = reduced polymer consumption (oil)
- ✓ Wood replacement options = longevity, reduced preservatives
- ✓ Weight reduction = improved fuel efficiency, reduced emissions
- ✓ Thermal insulation = improved fuel efficiency, reduced emissions
- ✓ Acoustic insulation = improved living environment
- ✓ Impact protection = improved safety
- ✓ Weight reduction = buoyancy, safety
- ✓ Cushioning = improved personal comfort
- ✓ Deformation recovery = Re-use in application
- ✓ 3D structure = improved design capability

Different aspects from the list above (and more may be applicable than those listed) will apply to different uses and companies, but we are all reliant to some level on Azodicarbonamide.

A few questions to consider as such data will help defence.....

From the areas above and any other application benefits you may consider, can they be proven? What data exists? What data could yet be prepared? What about recycling? Will there be significant cost implications to the consumer that may see end application products decline?

The use of Azodicarbonamide is highly accepted across Industry – but why? What data do we have to show we need foaming agent? Do we have data on the limitations of non-chemical options? What happens if we simply remove the product from the formula? Can the levels be reduced? What happens if the alternatives listed are used?

Is the risk to the consumer adequately controlled? Do we have data on residual Azodicarbonamide levels in finished goods? Is there a recognised test method that we can develop and standardise? How do we protect from goods made outside of the EU that may contain high levels and distort perception? Are we sure we are below 0.1% residual Azodicarbonamide in our finished articles?

In your production plant, is the risk to the production operative well managed? How do you handle the Azodicarbonamide? Are your staff fully trained and how many are direct contact? Do you minimise risk of dust? Do you have dust extraction? Does the staff have adequate personal protection equipment? Do you use Pre-blended material to dilute the handling risk or create a heavy powder to reduce the dust? Do you use a damped powder to reduce dust? A liquid dispersion or masterbatch may be used by your plant? Do you have dust in air monitoring to highlight and improve any areas of concern? Ultimately would you be comfortable from a visit by the HSE to check?



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At present, ECHA do not have much data on the general handling practices across Industry or if there is sufficient control already in place. Simple questioning to review how it is handled especially when in pure powder form, can demonstrate risk management control.

Currently companies throughout the supply chain are considering how continued use may be defended. West and Senior are examining these options and are in discussion with Azodicarbonamide production units to gauge support. One further proposal which is also in the early stages of development is referred to as the ADCA Task Force.

A Task Force co-ordinator has been selected who are based in Brussels and have specialist consultants across the different medical, legal and process sections of REACH. An initial meeting took place in May to establish if a Task Force could be created to gather data and finance a defence strategy. West and Senior attended this meeting and have been in contact with the Task Force founders since late 2012. We are following and contributing to the progression of the Group being formed which consists of representative companies from a varied range of polymer, process and level of supply chain. At present this Task Force is in its founding stages and aspects regarding membership level, structure, voting rights, cost structure and strategy are currently in discussion.

The Task Force is not the only route to defence, but if structured correctly and with enough support, the members may be able to generate data and finance third party scientific support and legal representation to target a co-ordinated Industrial defence.

Section 5 - Implications of Failure

Should it not be possible to defend for continued use of Azodicarbonamide, the consequences could be severe across many sectors of the polymer industry. As an additive, the concentration of foaming agent is relatively low and often a fraction of 1%, yet this small level makes the difference between foamed and heavy, solid articles. Failure to defend the chemistry, in cases where no alternative technology is found, could result in the decline of the application and therefore a decline in all associated materials and potential closure of manufacturing.

Alternative technology, if it can be developed and irrespective of cost, may lead to reduced technical performance and or reduced production efficiency. It should not be considered at this time that alternatives exist, as in many cases an answer may not be straight forward to find, if not impossible.

Time from all aspects of the supply chain will be required to assess and develop possible alternative technology and this will provide a drain upon manpower and require production based trialling to ensure suitability ahead of any Sunset Date. Such events will force a development plan to maintain production rather than develop growth for all those affected.

It must also be considered that companies may simply relocate their production units outside of Europe looking to produce and supply their finished foamed articles from areas not affected by REACH.

As the base chemical manufacture for Azodicarbonamide is non-European based, if a defence cannot be made showing committed requirement for this chemistry, the base Azodicarbonamide suppliers may withdraw from the European market in the belief that they can sell capacity elsewhere without implication of Authorisation to do so.

In all cases, if a defence fails and a company does not have specific Authorisation for continued use, it will be illegal to import, use or sell any material or finished item that contains greater than 0.1% Azodicarbonamide. The use of this chemistry could potentially die.



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Section 6 - Next Steps

The coming weeks will dictate the rate of focus and feedback required as the next meeting by ECHA is scheduled for late June 2013. West and Senior will continue to monitor the situation and findings of ECHA and where possible continue discussions with Authority representatives to enable a detailed understanding of any events being proposed.

Our discussion with suppliers, the Task Force and other interested parties will continue and further meetings are already being scheduled to maintain momentum.

During these next months, we would kindly ask companies to consider what levels of support data they could offer, or be willing to prepare, to defend the Industry wide use of Azodicarbonamide. To aid in the gathering of information, we shall be working together with the BPF to help them create a questionnaire / survey to establish trends in use, application and handling that may help inform Authorities on how business is managing risk and how daily and essential items may be affected. Should a public consultation follow, this survey and the considerations within this document will prove a backbone of reply considerations and again we would kindly ask that companies consider an individual but detailed response in addition to any reply going from the British Plastics Federation or other industry associations.

As time continues and other non-foaming chemistries further ahead of Azodicarbonamide in the time-line apply for Authorisation (note – as of 3rd June, 2013 no chemical has yet proceeded fully through the process of Authorisation) we aim to monitor the situation and examine possible routes to Authorisation if initial defence fails and this process is then required. Authorisation may follow a number of routes through and individual company approach, a supply chain route, a working group consideration or application through an Industry body.

Section 7 - Closing Comments

At present the long term security of Azodicarbonamide is in the balance and could tip either way. We consider that a defensive approach will help support any argumentation for continued use and thank you for your attendance to the meeting, your time in considering this document and your continued support.

West and Senior will support where possible and naturally honour any confidentiality should any individual assistance be required.

Azodicarbonamide is an expanding business, let's make sure our bubble isn't burst!

Thank you and thank you to the British Plastics Federation for their support and hospitality.

For further information please see –

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Appendix* – West and Senior / Information Collation

West and Senior Limited –

West and Senior Limited are a privately owned company based in Manchester, UK. Established in 1952, the company specialises in creating customer bespoke colour and additive formulations. The company has been importing, converting and improving a wide range of foaming agent chemistry since the 1980's and has a dedicated development laboratory and manufacturing hall for this technology. They remain independent of any Azodicarbonamide manufacturer yet have established direct communication with a number of leading producers of the base technology. Having an unsurpassed level of understanding regarding the chemicals handling and use, combined with industrial experience in application across numerous industrial sectors, they are centrally located within the cycle of supply and usage of this technology. With dedicated teams in foaming additives and colour they have established themselves as a leading supplier across a range of industrial and consumer based applications globally.

Since initial announcement by ECHA to review Azodicarbonamide in Sept, 2012 -
West and Senior.....

Have taken a committed decision to inform, support, collate and cross-reference information through –

- ✓ Communication with interested parties across Europe
- ✓ Communication with manufacturing plants
- ✓ Communication with UK Member State representative and HSE
- ✓ Liaison with a European based 'Task Force'
- ✓ Communication with Brussels based REACH Representation defence specialists

Our aim to raise industry awareness and defend continued use ADCA whilst supporting our customer base through these potentially difficult times.

Author –

Stephen Quinn has been working within the cellular polymer industry for in excess of 25 years. Few people across the Globe are considered to have similar levels of expertise and practical knowledge within this sector. Stephen has a wealth of proven history with regards to the foaming of polymers where he has developed material and application technology across Europe, Asia, Russia and the USA. He has presented numerous industrial papers and has technical summaries published by leading industry press.

END OF DOCUMENT

Disclaimer - This document is a summary of information taken and cross referenced from several meetings, official document releases and searches of Authority websites to identify the current standing with Azodicarbonamide. West and Senior Limited makes no representation as to the accuracy and/or completeness of this information. The information given is presented in good faith and is believed to be correct.



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