



Enabling
ZERO WASTE

ENABLING ZERO WASTE REPORT

RHYL PROMENADE



**CONSTRUCTING
EXCELLENCE
IN WALES**

ENABLING ZERO WASTE

Is a Constructing Excellence in Wales (CEW) initiative which provides practical, positive and proactive assistance to construction, demolition and civil engineering projects in Wales. The aim is to establish if, and how, the construction industry can achieve the zero waste targets established in the Welsh Government's waste strategy, Towards Zero Waste.

CEW is working in collaboration with the construction industry to provide a detailed insight into the achievability of zero waste. The goal being to share best practice solutions and opportunities, along with identifying any barriers associated with achieving the Welsh Government's targets.

CEW offers practical assistance to construction project design and site teams to explore viable solutions to achieving zero waste and EZW project objectives to;

- Understand and evidence when and how wastes occur during the construction process
- Understand current strategies, methodologies and opportunities for the diversion from landfill of site wastes
- Analyse the feasibility/viability of achieving zero waste to landfill in the current environment
- Work to develop solutions to prevent and minimise the generation of on-site waste, generating a reduction in waste management, disposal and landfill costs
- Support changes to behaviour and processes that encourage prevention and minimisation of waste
- Achieve site efficiencies from waste management opportunities/solutions
- Minimise site traffic through reduction in supplies and materials allowing for cost savings
- Disseminate solutions and opportunities from the development of effective waste management strategies
- Provide learning and education opportunities regarding alternative waste management techniques which can be disseminated for future projects ensuring continual benefits

COATECH LTD

Specialise in the application of all types of resin flooring systems for the commercial, domestic and industrial sectors.

They pride themselves on using the highest quality materials from market leading suppliers, and providing all clients with a quality finish and professional service.

They have a wealth of experience and technical knowledge in a broad range of commercial applications spanning over 50 years.

THE PROJECT



The scheme was a public realm project for Principal Contractor Dawnus and Client Denbighshire Council. Coatech installed approximately 4,600 m² of resin bonded surfacing as part of the continued development of the sea defence and promenade on Rhyl seafront.

The project value was £75,000 and was anticipated to start at the end of May 2015 completing mid June 2015. Due to ongoing programme delays and bad weather Coatech were unable to start work at the site until November 2015 and completed their work package in May 2016.

The works were completed under an NEC3 (Option A) Construction Contract.

METHODOLOGY

Each EZW project is provided with a tailored work plan/methodology. The content was developed with the project team and designed to enhance any existing measures being undertaken.

For the duration of the project, the Coatech project team was provided with:

- Technical waste management support and guidance for the duration of the project to assist with the pursuit of zero waste to landfill
 - A specific waste management resource allocated to provide hands on support with site waste management and to deliver potential zero waste options/ solutions for site waste issues. This assistance included;
- On-site visits
 - Waste management support advising upon increased segregation
 - Identification of materials used on site
 - Reduction in waste by encouraging good housekeeping to reduce damage
 - Reduction of waste through re-use or finding alternative solutions to disposal
 - Testing of unbound and bound aggregate.



Waste management support site visits were undertaken as part of Enabling Zero Waste, which included discussions with the site team regarding current site and waste issues, progress, potential solutions and improvements.

The principal waste management recommendations were to:

- Improve signage, segregation and storage of material
- Look for opportunities to reuse/recycle any surplus aggregate to ensure that material wasn't downgraded
- Identify a waste champion to review and ensure that legal compliance and waste management best practices are met
- Undertake toolbox talks to raise awareness of waste prevention and reduction

Communications involved regular updates via twitter, the CEW newsletter and website. Aerial drone imagery was also carried out before, during and after the surface dressing was complete.



PRACTICES

Previous practice was to have a mixed waste skip for all of the waste produced from a project. This would have led to cross contamination of recyclate and the downcycling of material which may have been sent to landfill if bound together with any of the resins.



Former storage practice

It was suggested to Coatech that by taking simple measures such as segregating the bound sweepings from the other waste this would help improve recycling and recovery efficiencies. In addition, for the unbound material, practices were introduced whereby the unbound aggregate sweepings would be kept aside for use in other projects (such as landscaping works) rather than being downcycled.

UPCYCLING OF MATERIAL

Testing

In order to ensure that the aggregate sweepings would be safe to use again on other projects for example as recycled aggregate, fill and road dressing, CEW instructed Celtest Laboratory to undertake the Dangerous Substances Chemical Analysis: List I and List II Parameters on both the unbound and bound material.

The samples were subjected to leachate preparation in accordance with BS EN 1744-3:2002. The generated leachate was analysed to determine the potential Dangerous Substances contents, which were compared to relevant

criteria (e.g. published Environmental Quality Standards (EQS), Water Supply Regulations 2010).

All parameters analysed complied with the most stringent criteria (EQS limits, Water Supply limits, etc). The analysed concentrations of several organic and inorganic parameters were reported as less than the analytical detection limits.

The results of the analysis demonstrated that the leachate generated complied with the Dangerous Substances Directive (DSD) (76/464/EEC) and its 'daughter' directives, and also the

Construction Products Directive (CPD 89/106/EEC), Essential Requirement No. 3 "Hygiene, Health and the Environment". Therefore, it was concluded that the material did not pose a risk of harm to the aquatic environment.

This finding is significant in terms of developing a market for the material and also in terms of demonstrating the safe use of its application.

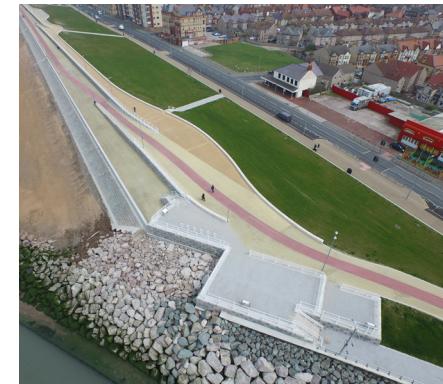
The full test results can be found in Appendix A of this report.

RHYL PROMENADE

October 2015



May 2016



DATA ANALYSIS

Key waste streams produced from the surface dressing comprised containers; packaging; pallets and surplus aggregate. The quantities and destinations of which are outlined below.

The total amount of waste produced as part of the project equated to 3.34 tonnes. The volumes and/or tonnages of specific materials are not available as the chosen waste management company did not offer this facility.

The only reporting mechanism offered was the provision of a waste transfer note on an annual basis.

Containers

Four hundred and twenty plastic resin containers (20L) and lids were produced during the duration of the project and were sent for recycling at ASH before being sent for further processing in England.

Four hundred and twenty metal resin containers (20L) and lids were also produced and sent for recycling at ASH along with twelve plastic buckets.

Packaging

A large proportion of the waste arising from the project resulted from product packaging. Eighty four cardboard boxes from resin deliveries were sent for recycling at ASH. Quantities of plastic wrapping from the bags of aggregate and pallets were also produced all of which were recycled by ASH before being sent for further reprocessing.

Pallets

Sixty three pallets were left over at the end of the project. Fifty one of these were reused by a local distribution business for packaging with the remainder used by North Denbighshire Communities First 'Community Garden' project in Rhyl.

Aggregates

Eleven tonnes of surplus aggregate was produced as a result of the sweepings. Five tonnes of this were used by a local landscaping company and four tonnes were used by North Denbighshire Communities 'Community Garden' project in Rhyl. The remaining two tonnes were processed by Thorncliffe into recycled aggregate (SHW Clause 803 Type 1).

Additional Materials

In addition to the above, fifteen rubber heads were used along with

8  **barrier tape**

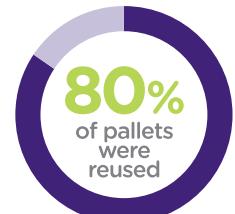
6  **masking tape**

24  **roller heads**

were also produced along with

100  **brushes**

These items were unusable due to them being bonded by hardened resin and were disposed of in landfill.





ANALYSIS BY WASTE MANAGEMENT OPTION

Reuse

During the project nine tonnes of unbound aggregate was able to be reused through the segregation of the aggregate sweepings and classification of this material as end of waste. This is a significant step towards the circular economy approach as material is able to be reused rather than being downcycled.

Sixty three pallets were left over at the end of the project. Fifty one of these were reused by a local distribution business for packaging with the remainder used by North Denbighshire Communities 'Community Garden' project in Rhyl.

Rhyl Promenade

Recycling & Energy Recovered

The majority of the waste produced on the project was reported to be recycled by ASH. Overall recycling, recovery, rdf and landfill rates have been provided for the time period in question, however, these are not material specific.

ASH reported that for the waste processed during the relevant time period 28% was recycled, 60% was processed as RDF, 2% was recovered and 10% was sent to landfill. It is not currently known whether the RDF is sent to a R1 classified Energy Recovery facility in terms of classifying this activity as 'Recovery' rather than 'Disposal'.

Landfill

In addition to the quantities reported above, fifteen rubber heads, eight rolls of barrier tapes, six rolls of masking tape, twenty four roller heads and one hundred brushes were sent to landfill. Landfill was reported to be the only available option for these items given their resin bound nature.

Targets

The Welsh Government aims for 100% diversion of construction and demolition waste from landfill by 2050. This target has not been possible as part of this project, predominantly as a result of the resin coated waste streams.

CONSTRAINTS

Legacy Materials

An environmentally friendly solution was difficult to find with regard to the resin tins. Suppliers were contacted to see if there was a solution for the empty tins, however, due to the small quantities involved a take-back service was reported to not be viable. ASH Recycling provided a solution in that all recyclable waste could be placed in one skip and sorted at the waste site. Given the nature of resin, once products such as brushes, roller heads, tape etc come into contact with the substance there is little that can be done to reuse or recycle these items. In this instance these impacted materials were sent straight to landfill, affecting the recycling rates for the project.

Programme Delays

Delays within the programme meant that work started in winter rather than the summer

as planned. The surface dressing method that the Client had requested was not considered suitable for laying in wet weather which meant that there were further delays. These concerns and an alternative method were highlighted to the Client, however, the decision was taken to proceed with the original process.

Markets for Recyclate

If the surplus aggregate sweepings were to be used on other surface dressing projects these would need to be washed and dried to ensure that the material was clean, dry and dust free to ensure its suitability for reuse.

Any deleterious material or surface moisture present would inhibit the aggregates ability to adhere to the resin binder. In order to investigate the potential for reuse a simple laboratory exercise was carried out as a time and motion study to

estimate the time and cost of fully recovering the aggregate.

In summary, the exercise demonstrated that if Coatech or similar companies were paying over £105 per tonne of virgin aggregate, the washing and drying of surplus sweepings would be cost beneficial. The full details of the study are included in Appendix B of this report.

Markets for the surplus sweepings to be used in landscaping projects etc would need to be established in order to ensure that there is a continued need for the product and at the quantities available.

Otherwise it is likely that this material would be downcycled into aggregate.

SUCCESS

- Committed and enthusiastic site team
- Segregation of materials
- Approximately nine tonnes of unbound aggregate prevented from being downgraded through the segregation of the aggregate sweepings
- Sixty three pallets reused
- Volunteered to look at and analyse zero waste outcomes
- Small quantities of waste sent to landfill

During the project nine tonnes of unbound aggregate was able to be reused through the segregation of the aggregate sweepings. This is a significant step towards the circular economy approach as material is able to be reused rather than being downcycled.

RECOMMENDATIONS

Supply Chain

It is recommended that all suppliers of product strive to provide a solution for packaging at the end of the products use, as well as providing clear guidance whether materials can be recycled and are hazardous or non-hazardous.

Contractor

An investment in drying equipment would help Coatech and other similar organisations to ensure that surplus sweepings of aggregate could be used in additional surface dressing projects to the same high quality.

It is also recommended that requirements for individual waste transfer notes are requested from the waste management company. This will help to establish a clear picture in terms of waste arisings and recovery rates per project and would help to improve environmental efficiencies and cost savings in the future.

Waste Management Company

It is recommended that duty of care notes are provided on an individual basis in order to allow companies to plan and monitor their waste arisings more efficiently.

Client

It is necessary for the Client to recognise the impact that programme delays can have on sub contractors who are scheduled last on a project. In particular importance are specialist contractors whose activities may be dependent upon the weather. These aspects can have a significant influence in terms of overall project delays. In addition, it is recognised for clients to be mindful when discussing alternative methodologies.



SUMMARY

The process utilised by Coatech is long-established and widely used.

The process is similar to the surfacing dressing process universally adopted in highway maintenance except for a number of fundamental differences

1. The binder used by Coatech is resin based not bitumen

2. The process is not mechanised but is hand laid

3. The aggregate used is selected for colour rather than technical properties and is disproportionately costly

Point 2 above is less significant than points 1 and **3**. Resin is a more difficult material to deal with than bitumen and is effectively non-recoverable once used.

Also because of the small scale nature of the work the resin is supplied in small containers which present a problem for recovery.

Similarly, the aggregate is delivered in 50kg bags and use of the collected and washed and dried surplus on another scheme is entirely dependent on a Client's colour choice.

Further discussions with the industry may be of value to review any future developments in the binder industry.

Procurement is key - clients need to recognise the negative impact of the materials being specified and alternatives need to be explored.



APPENDIX A

Sample 1

Test Requirements

Dangerous Substances Chemical Analysis: List I and List II Parameters.

Sample Details	Sample Details
Certificate of sampling received	No
Laboratory Ref. No.	S54545
Client Ref. No.	Sample 1
Date and Time of Sampling	Unknown
Date of Receipt at Lab	04.09.2015
Date of Start of Test	17.09.2015
Sampling Location	Unknown
Name of Source	Unknown
Method of Sampling	Unknown
Sampled By	Client
Material Description	RSE In Bound Stone
Target Specification	N/A

Comments/Departure From Specified Procedure

The work was carried out by our accredited, competent, sub contracted laboratory.

Leachable Compounds of Concern

S54545 Sample 1

HEAVY METALS:

Antimony (dissolved) (µg Sb/l)	< 0.17
Arsenic (dissolved) (µg As/l)	0.33
Barium (dissolved) (µg Ba/l)	7.0
Cadmium (dissolved) (µg Cd/l)	< 0.03
Chromium (dissolved) (µg Cr/l)	< 0.25
Copper (dissolved) (µg Cu/l)	0.6
Lead (dissolved) (µg Pb/l)	< 0.09
Mercury (dissolved) (µg Hg/l)	< 0.01
Molybdenum (dissolved) (µg Mo/l)	1.8
Nickel (dissolved) (µg Ni/l)	< 0.5
Selenium (dissolved) (µg Se/l)	< 0.25
Zinc (dissolved) (µg Zn/l)	< 1.25

ANIONS

Chloride (mg Cl/l)	0.76
Fluoride (mg F/l)	< 0.10
Sulphate (mg SO ₄ /l)	2.5

PAHs

Acenaphthene (µg/l)	< 0.01
Acenaphthylene (µg/l)	< 0.01
Anthracene (µg/l)	< 0.01
Benzo[a]anthracene (µg/l)	< 0.01
Benzo[a]pyrene (µg/l)	< 0.01
Benzo[b]fluoranthene (µg/l) (µg/l)	< 0.01
Benzo[k]fluoranthene (µg/l)	< 0.01
Benzo[g,h,i]perylene (µg/l)	< 0.01
Chrysene (µg/l)	< 0.01
Coronene (µg/l)	< 0.01
Dibenz[a,h]anthracene (µg/l)	< 0.01
Fluoranthene (µg/l)	< 0.01
Fluorene (µg/l)	< 0.01
Indeno[1,2,3-cd]pyrene (µg/l)	< 0.01
Naphthalene (µg/l)	< 0.01
Phenanthrene (µg/l)	< 0.01
Pyrene (µg/l)	< 0.01

OTHER ORGANICS

Phenol (µg/l)	<0.50
Dissolved Organic Carbon (mg/l)	< 2.0

Interpretation

The sample referenced S/N S54545 Sample 1 was subjected to leachate preparation in accordance with BS EN 1744-3:2002. The generated leachate was analysed to determine the potential Dangerous Substances contents, which were subsequently compared to relevant criteria (e.g. published Environmental Quality Standards (EQS), Water Supply Regulations 2010).

All heavy metal parameters analysed comply with the most stringent criteria (EQS limits, Water Supply limits, etc), several being present at less than analytical detection limits.

All Inorganic anion parameters analysed comply with the most stringent criteria (EQS limits, Water Supply limits, etc).

All Polycyclic Aromatic Hydrocarbon (PAH) parameters comply with the most stringent criteria (EQS limits, Water Supply limits, etc), all species analysed being present at less than analytical detection limits.

Leachable Phenol was present at less than analytical detection limits.

Dissolved Organic Carbon was present at less than analytical detection limits.

Conclusion

The sample referenced S/N S54545 Sample 1 was subjected to leachate preparation in accordance with BS EN 1744-3:2002. The generated leachate was analysed to determine the potential Dangerous Substances contents, which were compared to relevant criteria (e.g. published Environmental Quality Standards (EQS), Water Supply Regulations 2010).

It must be noted that the EQS are the concentrations of leached parameters contained within the receiving water - not the parameter concentration of the leachate; the dilution effect of the receiving water must be taken into account when assessing the overall risk of leachable parameters to the aqueous environment.

Therefore, the identified leachate concentrations would be subject to further dilution in the environment, typically at least 100 fold.

All parameters analysed comply with the most stringent criteria (EQS limits, Water Supply limits, etc). The analysed concentrations of several organic and inorganic parameters were reported as less than the analytical detection limits.

The results of analysis demonstrate that the leachate generated by sample referenced S54545 Sample 1 complies with the Dangerous Substances Directive (DSD) (76/464/ EEC) and its 'daughter' directives, and also the Construction Products Directive (CPD 89/106/ EEC), Essential Requirement No. 3 "Hygiene, Health and the Environment". Therefore, it may be concluded that the material does not pose a risk of harm to the aquatic environment.

Sample 2

Test Requirements

Dangerous Substances Chemical Analysis: List I and List II Parameters.

Sample Details

Certificate of sampling received	No
Laboratory Ref. No.	S54545
Client Ref. No.	Sample 2
Date and Time of Sampling	Unknown
Date of Receipt at Lab	04.09.2015
Date of Start of Test	17.09.2015
Sampling Location	Unknown
Name of Source	Unknown
Method of Sampling	Unknown
Sampled By	Client
Material Description	RSE In Bound Stone
Target Specification	N/A

Sample Details

Comments/Departure From Specified Procedure

The work was carried out by our accredited, competent, sub contracted laboratory.



Leachable Compounds of Concern

HEAVY METALS:

Antimony (dissolved) (µg Sb/l)	< 0.17
Arsenic (dissolved) (µg As/l)	< 0.16
Barium (dissolved) (µg Ba/l)	4.6
Cadmium (dissolved) (µg Cd/l)	< 0.03
Chromium (dissolved) (µg Cr/l)	< 0.25
Copper (dissolved) (µg Cu/l)	1.7
Lead (dissolved) (µg Pb/l)	< 0.09
Mercury (dissolved) (µg Hg/l)	< 0.01
Molybdenum (dissolved) (µg Mo/l)	1.1
Nickel (dissolved) (µg Ni/l)	< 0.5
Selenium (dissolved) (µg Se/l)	< 0.25
Zinc (dissolved) (µg Zn/l)	< 1.25

ANIONS

Chloride (mg Cl/l)	0.48
Fluoride (mg F/l)	< 0.10
Sulphate (mg SO ₄ /l)	0.67

PAHs

Acenaphthene (µg/l)	< 0.01
Acenaphthylene (µg/l)	< 0.01
Anthracene (µg/l)	< 0.01
Benzo[a]anthracene (µg/l)	< 0.01
Benzo[a]pyrene (µg/l)	< 0.01
Benzo[b]fluoranthene (µg/l) (µg/l)	< 0.01
Benzo[k]fluoranthene (µg/l)	< 0.01
Benzo[g,h,i]perylene (µg/l)	< 0.01
Chrysene (µg/l)	< 0.01
Coronene (µg/l)	< 0.01
Dibenzo[a,h]anthracene (µg/l)	< 0.01
Fluoranthene (µg/l)	< 0.01
Fluorene (µg/l)	< 0.01
Indeno[1,2,3-cd]pyrene (µg/l)	< 0.01
Naphthalene (µg/l)	< 0.01
Phenanthrene (µg/l)	< 0.01
Pyrene (µg/l)	< 0.01

OTHER ORGANICS

Phenol (µg/l)	< 0.50
Dissolved Organic Carbon (mg/l)	< 2.0

S54545 Sample 2

Interpretation

The sample referenced S/N S54545 Sample 2 was subjected to leachate preparation in accordance with BS EN 1744-3:2002. The generated leachate was analysed to determine the potential Dangerous Substances contents, which were subsequently compared to relevant criteria (e.g. published Environmental Quality Standards (EQS), Water Supply Regulations 2010).

All heavy metal parameters analysed comply with the most stringent criteria (EQS limits, Water Supply limits, etc), several being present at less than analytical detection limits.

All Inorganic anion parameters analysed comply with the most stringent criteria (EQS limits, Water Supply limits, etc).

All Polycyclic Aromatic Hydrocarbon (PAH) parameters comply with the most stringent criteria (EQS limits, Water Supply limits, etc), all species analysed being present at less than analytical detection limits.

Leachable Phenol was present at less than analytical detection limits.

Dissolved Organic Carbon was present at less than analytical detection limits.

Conclusion

The sample referenced S/N S54545 Sample 2 was subjected to leachate preparation in accordance with BS EN 1744-3:2002. The generated leachate was analysed to determine the potential Dangerous Substances contents, which were subsequently compared to relevant criteria (e.g. published Environmental Quality Standards (EQS), Water Supply Regulations 2010).

It must be noted that the EQS are the concentrations of leached parameters contained within the receiving water – not the parameter concentration of the leachate; the dilution effect of the receiving water must be taken into account when assessing the overall risk of leachable parameters to the aqueous environment.

Therefore, the identified leachate concentrations would be subject to further dilution in the environment, typically at least 100 fold.

All parameters analysed comply with the most stringent criteria (EQS limits, Water Supply limits, etc). The analysed concentrations of several organic and inorganic parameters were reported as less than the analytical detection limits.

The results of analysis demonstrate that the leachate generated by sample referenced S54545 Sample 2 complies with the Dangerous Substances Directive (DSD) (76/464/EEC) and its 'daughter' directives, and also the Construction Products Directive (CPD 89/106/EEC), Essential Requirement No. 3 "Hygiene, Health and the Environment". Therefore, it may be concluded that the material does not pose a risk of harm to the aquatic environment.



APPENDIX B

A Time and Motion Study to Determine the Cost of Recovery of Surplus Aggregate from a Specialist Paving Operation

CEW has been working with Coatech of Rhyl as part of the EZW project to look at options for realising easily achieved improvements in waste management.

The contract chosen for the EZW project is the promenade at Rhyl seafront where Coatech operated as a specialist surfacing sub contractor to Dawnus Construction.

Coatech used a conventional binder/aggregate surface dressing technique to achieve the specified finished paved area on the promenade.

The specified aggregates were

- Silver Grey Granite (2-5mm)
- Dorset Gold (1-3mm)
- HM Quartz (1-3mm)
- Brittany Bronze (1-3mm)
- Staffordshire Flint (3-6mm)
- Multiflint (1-3mm)

which are supplied in **25kg** bags. Cost of the aggregates vary, but on average, are in the region of approximately **£4.50** per bag (equivalent to **£180.00** per tonne). The process involves spreading an epoxy based binder

and scattering by hand aggregate beyond surface saturation to ensure maximum coverage of aggregate.

Twenty four hours after laying (weather permitting) the surplus aggregate which is not adhered to the binder is swept off the pavement.

This material conventionally amounts to **30%** of the total material used. Conventionally this material had been disposed of using a standard mix waste skip.



Objective

To undertake a timed exercise to determine the man hours, equipment and energy costs of recovering the surplus aggregate and preparing it for re-use.

Method

A sample of **500kg** of 5mm single size aggregate contained in a nylon "builders' bag" was washed using a simple water stream from a garden hose placed over the top surface of the aggregate. It was then found necessary to wash the aggregate over a **450mm** diameter **2mm** sieve to remove any detritus. After washing, the material was loaded into oven trays and dried overnight in a **2kw** laboratory drying oven. The maximum loading in a single oven was found to be **100kg**. After drying the clean aggregate was placed into clean plastic bags.

Results

The total man hours needed to wash and dry **0.5 tonnes** was **2.25hrs** using a single oven,

it would be reasonable to assume that using

2 ovens

1T of aggregate could be washed and dried in **4.5hrs** with **5 overnight dryings**

Conclusion

The cost of recovering **1 tonne** of clean washed and bagged aggregate is approximately

4.5 man hours at £15/per hr **£67.50**

Energy Costs 240 kwh at 12p per kwh

£28.70

20 plastic sacks at £0.20

£4.00

Total: £99.20

Second hand drying ovens would cost approximately **£600.00** which at this rate of operation would be expected to function for at least two years during which time **100 tonnes** could be recovered. (i.e. adding **£6.00** per tonne to the recovery cost)

A total recovered cost of **£105.00** per tonne may be considered as an economic alternative if the cost of new aggregate is greater than **£105.00** per tonne.

ATODIAD B

Astudiaeth Amser a Symudiad i benderfynu beth fyddai Cost Adfer Agreg Dros Ben o Brosiect Palmantu Arbenigol

Mae CEW wedi bod yn gweithio gyda Coatech o'r Rhyl fel rhan o'r prosiect EZW i edrych ar opsiynau i wneud gwelliannau hawdd eu cyflawni o ran rheoli gwastraff.

Y contract a ddewiswyd ar gyfer y prosiect EZW yw'r promenâd ar hyd glan môr y Rhyl lle'r oedd Coatech yn gweithio fel is-gontactwr wynebu arbenigol i gwmni Dawnus Construction.

Defnyddiodd Coatech dechneg ail-wynebu agreg / glynwr confensiynol i ail-wynebu'r rhan o'r palmant dan sylw ar hyd y promenâd fel y gofynnwyd.

Yr agregau y gofynnwyd amdanyst oedd:

- Silver Grey Granite (2-5mm)
- Dorset Gold (1-3mm)
- HM Quartz (1-3mm)
- Brittany Bronze (1-3mm)
- Staffordshire Flint (3-6mm)
- Multiflint (1-3mm)

sy'n cael eu cyflenwi mewn bagiau **25kg**. Mae cost yr agregau'n amrywio ond ar gyfartaledd maen nhw tua **£4.50** y bag (**£180.00** y dunnell). Mae'r broses yn golygu taenu glynwr epocsi

yna gwasgaru'r agreg â llaw i orchuddio'r wyneb yn ddwfn a sicrhau'r gorchudd mwyaf posib o agreg.

24 awr ar ôl gosod (os yw'r tywydd yn caniatâu), mae'r agreg dros ben sydd heb lynn wrth y glynwr yn cael ei ysgubo oddi ar y palmant.

Mae'r deunydd hwn fel arfer yn oddeutu **30%** o'r cyfanswm a ddefnyddiwyd. Fel arfer mae'r deunydd wedi cael ei waredu i sgip gwastraff cymysg arferol.

Amcan

Cyflawni ymarfer wedi'i amseru i nodi'r costau ynni, oriau gweithiwr a'r cyfarpar y byddai eu hangen i adfer yr agreg dros ben a'i baratoi ar gyfer ei ailddefnyddio.

Dull

Cafodd sampl **500kg** o agreg 5mm un maint mewn 'bag adeiladwr' neilon ei olchi'n defnyddio ffrwd ddŵr gyffredin o beiben dyfrio gardd a osodwyd dros wyneb uchaf yr agreg. Cafwyd wedyn bod angen golchi'r agreg uwchben gogr **2mm** diamedr o **450mm** i gael gwared ar unrhyw siwrwd. Ar ôl golchi, cafodd y deunydd ei lwytho ar dreiau popty a'i sychu dros nos mewn popty sychu labordy **2kw**. Y llwyth mwyaf mewn un popty oedd **100kg**. Ar ôl ei sychu cafodd yr agreg glân ei roi mewn bagiau plastig glân.

Canlyniadau

Cyfanswm yr oriau gweithiwr oedd ei angen i olchi a sychu

0.5 tunnell **2.25 awr**

yn defnyddio un popty. Byddai'n rhesymol tybio y yn defnyddio

2 bopty 

1 dunnell golchi a sychuo agreg

mewn **4.5 awr** gyda **5 cyfnod sychu** dros nos.



Casgliad

Mae'r gost o adfer **un dunnell** o agreg glân wedi'i olchi a'i fagio yn oddeutu

4.5 oriau gweithiwr am £15 yr awr

£67.50

Costau ynni 240 kwh am 12c y kwh

£28.70

20 o sachau plastig am £0.20c

£4.00

Cyfanswm: £99.20

Byddai poptai sychu ail-law'n costio tua **£600.00** ac, ar sail y gwaith a fyddai'n cael ei wneud, byddai disgwyl iddynt weithio am ddwy flynedd o leiaf a, dros y cyfnod hwn, gellid adfer 100 o dunelli. (h.y. drwy ychwanegu **£6.00** y dunnell i'r gost adfer)

Gallai cyfanswm cost adfer o **£105.00** y dunnell fod yn opsiwn economaidd pe bai'r gost o brynu agreg newydd yn fwy na **£105.00** y dunnell.



Cyfansoddion Trwytholchadwy sy'n Destun Pryder

S54545 Sampl 2

HEAVY METALS:

Antimony (dissolved) ($\mu\text{g Sb/l}$)	< 0.17
Arsenic (dissolved) ($\mu\text{g As/l}$)	< 0.16
Barium (dissolved) ($\mu\text{g Ba/l}$)	4.6
Cadmium (dissolved) ($\mu\text{g Cd/l}$)	< 0.03
Chromium (dissolved) ($\mu\text{g Cr/l}$)	< 0.25
Copper (dissolved) ($\mu\text{g Cu/l}$)	1.7
Lead (dissolved) ($\mu\text{g Pb/l}$)	< 0.09
Mercury (dissolved) ($\mu\text{g Hg/l}$)	< 0.01
Molybdenum (dissolved) ($\mu\text{g Mo/l}$)	1.1
Nickel (dissolved) ($\mu\text{g Ni/l}$)	< 0.5
Selenium (dissolved) ($\mu\text{g Se/l}$)	< 0.25
Zinc (dissolved) ($\mu\text{g Zn/l}$)	< 1.25

ANIONS:

Chloride (mg Cl/l)	0.48
Fluoride (mg F/l)	< 0.10
Sulphate (mg SO_4/l)	0.67

PAHs

Acenaphthene ($\mu\text{g/l}$)	< 0.01
Acenaphthylene ($\mu\text{g/l}$)	< 0.01
Anthracene ($\mu\text{g/l}$)	< 0.01
Benzo[a]anthracene ($\mu\text{g/l}$)	< 0.01
Benzo[a]pyrene ($\mu\text{g/l}$)	< 0.01
Benzo[b]fluoranthene ($\mu\text{g/l}$) ($\mu\text{g/l}$)	< 0.01
Benzo[k]fluoranthene ($\mu\text{g/l}$)	< 0.01
Benzo[g,h,i]perylene ($\mu\text{g/l}$)	< 0.01
Chrysene ($\mu\text{g/l}$)	< 0.01
Coronene ($\mu\text{g/l}$)	< 0.01
Dibenzo[a,h]anthracene ($\mu\text{g/l}$)	< 0.01
Fluoranthene ($\mu\text{g/l}$)	< 0.01
Fluorene ($\mu\text{g/l}$)	< 0.01
Indeno[1,2,3-cd]pyrene ($\mu\text{g/l}$)	< 0.01
Naphthalene ($\mu\text{g/l}$)	< 0.01
Phenanthrene ($\mu\text{g/l}$)	< 0.01
Pyrene ($\mu\text{g/l}$)	< 0.01

OTHER ORGANICS

Phenol ($\mu\text{g/l}$)	< 0.50
Dissolved Organic Carbon (mg/l)	< 2.0

Dehongliad

Profwyd sampl cyfeirnod S/N S54545 Sampl 2 gyda pharatoad o drwytholch yn unol â BS EN 1744-3:2002. Yna dadansoddwyd y trwytholch a gynhyrchwyd i ganfod unrhyw Sylwedduau Peryglus posib a'u cymharu â meini prawf perthnasol (e.e. Safonau Ansawdd Amgylcheddol (EQS) cyhoedddegig, Rheoliadau Cyflenwad Dŵr 2010).

Mae'r holl baramedrau mhetalaau trwm yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc), gyda llawer yn bresennol ar lai na'r trothwyon canfod dadansoddol.

Roedd yr holl baramedrau anion anorganig a ddadansoddwyd yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc). Mae'r holl baramedrau Hydrocarbon Aromatig Amgylcheddol (PAH) yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc), gyda'r holl rywogaethau

a ddadansoddwyd yn bresennol ar lai na'r trothwyon canfod dadansoddol.

Roedd Ffenol Trwytholchadwy'n bresennol ar lai na'r trothwyon canfod dadansoddol.

Roedd Carbon Organig Toddedig yn bresennol ar lai na'r trothwyon canfod dadansoddol.

Profwyd sampl cyfeirnod S/N S54545 Sampl 2 gyda pharatoad o drwytholch yn unol â BS EN 1744-3:2002. Yna dadansoddwyd y trwytholch a gynhyrchwyd i ganfod unrhyw Sylwedduau Peryglus posib a'u cymharu â meini prawf perthnasol

(e.e. Safonau Ansawdd Amgylcheddol (EQS) cyhoedddegig, Rheoliadau Cyflenwad Dŵr 2010).

Rhaid nodi mai'r EQS yw'r crynodiadau o baramedrau wedi trwytholchi yn y dŵr sy'n derbyn - nid crynodiad paramedr y trwytholch; rhaid ystyried effaith glastwreiddio'r dŵr sy'n derbyn wrth asesu'r risg

gyffredinol o baramedrau trwytholchadwy i'r amgylchedd dŵr. 25 26 Felly byddai'r crynodiadau trwytholch a ganfuwyd yn cael eu glastwreiddio ymhellach yn yr amgylchedd, fel arfer o leiaf 100 gwaith.

Roedd yr holl baramedrau a ddadansoddwyd yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc). Roedd y crynodiadau o nifer o baramedrau organig ac anorganig yn llai na'r trothwyon canfod dadansoddol.

Dengys canlyniadau'r dadansoddiau fod y trwytholch a gynhyrchwyd gan sampl cyfeirnod S54545 Sampl 2 yn cydymffurfio â'r Gyfarwyddeb Sylwedduau Peryglus (DSD) (76/464/ EEC) a'i 'chwae'r gyfarwyddebau, hefyd gyda'r Gyfarwyddeb Cynhyrchion Adeiladu (CPD 89/106/ EEC), Gofyniad Hanfodol Rhif 3 "Hylendid, Iechyd a'r Amgylchedd". Y casgliad felly yw nad yw'r deunydd yn cyflwyno unrhyw risg o niwed i'r amgylchedd dŵr.



Dehongliad

Profwyd sampl cyfeirnod Sampl 1 S/N S54545 gyda pharatoad o drwytholch yn unol â BS EN 1744-3:2002. Yna dadansoddwyd y trwytholch a gynhyrchwyd i ganfod unrhyw Sylweddau Peryglus posib a'u cymharu â meini prawf perthnasol (e.e. Safonau Ansawdd Amgylcheddol (EQS) cyhoeddodedig, Rheoliadau Cyflenwad Dŵr 2010).

Mae'r holl baramedrau mhetalaus trwm yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc), gyda llawer yn bresennol ar lai na'r trothwyon canfod dadansoddol.

Roedd yr holl baramedrau anion anorganig a ddadansoddwyd yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc).

Mae'r holl baramedrau Hydrocarbon Aromatig Amlgylcheddol (PAH) yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon

Cyflenwad Dŵr, etc), gyda'r holl rywogaethau a ddadansoddwyd yn bresennol ar lai na'r trothwyon canfod dadansoddol. Roedd Ffenol Trwytholchadwy'n bresennol ar lai na'r trothwyon canfod dadansoddol.

Roedd Carbon Organig Toddedig yn bresennol ar lai na'r trothwyon canfod dadansoddol.

Casgliad

Profwyd sampl cyfeirnod S/N S54545 Sampl 1 gyda pharatoad o drwytholch yn unol â BS EN 1744-3:2002. Yna dadansoddwyd y trwytholch a gynhyrchwyd i ganfod unrhyw Sylweddau Peryglus posib a'u cymharu â meini prawf perthnasol (e.e. Safonau Ansawdd Amgylcheddol (EQS) cyhoeddodedig, Rheoliadau Cyflenwad Dŵr 2010).

Rhaid nodi mai'r EQS yw'r crynodiadau o baramedrau wedi trwytholchi yn y dŵr sy'n derbyn - nid crynodiad paramedr y trwytholch; rhaid ystyried effaith glastwreiddio'r dŵr sy'n derbyn wrth asesu'r risg gyffredinol o baramedrau

trwytholchadwy i'r amgylchedd dŵr. Felly byddai'r crynodiadau trwytholch a ganfuwyd yn cael eu glastwreiddio ymhellach yn yr amgylchedd, fel arfer o leiaf 100 gwaith.

Roedd yr holl baramedrau a ddadansoddwyd yn cydymffurfio â'r meini prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc). Roedd y crynodiadau o nifer o baramedrau organig ac anorganig yn llai na'r trothwyon canfod dadansoddol.

Dengys canlyniadau'r dadansoddiad fod y trwytholch a gynhyrchwyd gan sampl cyfeirnod S54545 Sampl 1 yn cydymffurfio â'r Gyfarwyddeb Sylweddau Peryglus (DSD) (76/464/ EEC) a'i 'chwaer' gyfarwyddebau, hefyd gyda'r Gyfarwyddeb Cynhyrchion Adeiladu (CPD 89/106/ EEC), Gofyniad Hanfodol Rhif 3 "Hylendid, lechyd a'r Amgylchedd".

Y casgliad felly yw nad yw'r deunydd yn cyflwyno unrhyw risg o niwed i'r amgylchedd dŵr.

Sampl 2

Gofynion Profi

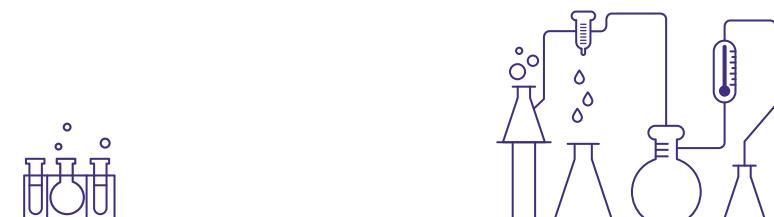
Dadansoddiad Cemegol o Sylweddau Peryglus: Paramedrau Rhestr I a Rhestr II.

Manylion y Sampl

Certificate of sampling received	No
Laboratory Ref. No.	S54545
Client Ref. No.	Sample 2
Date and Time of Sampling	Unknown
Date of Receipt at Lab	04.09.2015
Date of Start of Test	17.09.2015
Sampling Location	Unknown
Name of Source	Unknown
Method of Sampling	Unknown
Sampled By	Client
Material Description	RSE In Bound Stone
Target Specification	N/A

Sylwadau / Ymadawiad o'r Weithdrefn Benodedig

Cafodd y gwaith ei gyflawni gan ein labordy achrededig, gymwys sydd wedi hisgontactio.



ATODIAD A

Sample 1

Gofynion Profi

Dadansoddiad Cemegol o Sylweddau Peryglus: Paramedrau Rhestr I a Rhestr II.

Manylion y Sampl

Certificate of sampling received	No
Laboratory Ref. No.	S54545
Client Ref. No.	Sample 1
Date and Time of Sampling	Unknown
Date of Receipt at Lab	04.09.2015
Date of Start of Test	17.09.2015
Sampling Location	Unknown
Name of Source	Unknown
Method of Sampling	Unknown
Sampled By	Client
Material Description	RSE In Bound Stone
Target Specification	N/A

Sylwadau / Ymadawiad o'r Weithdrefn Benodedig

Cafodd y gwaith ei gyflawni gan ein labordy achrededig, gymwys sydd wedi hisgontactio.

Cyfansoddion Trwytholchadwy sy'n Destun Pryder

S54545 Sampl 1

HEAVY METALS:

Antimony (dissolved) (µg Sb/l)	< 0.17
Arsenic (dissolved) (µg As/l)	0.33
Barium (dissolved) (µg Ba/l)	7.0
Cadmium (dissolved) (µg Cd/l)	< 0.03
Chromium (dissolved) (µg Cr/l)	< 0.25
Copper (dissolved) (µg Cu/l)	0.6
Lead (dissolved) (µg Pb/l)	< 0.09
Mercury (dissolved) (µg Hg/l)	< 0.01
Molybdenum (dissolved) (µg Mo/l)	1.8
Nickel (dissolved) (µg Ni/l)	< 0.5
Selenium (dissolved) (µg Se/l)	< 0.25
Zinc (dissolved) (µg Zn/l)	< 1.25

ANIONS

Chloride (mg Cl/l)	0.76
Fluoride (mg F/l)	< 0.10
Sulphate (mg SO ₄ /l)	2.5

PAHs

Acenaphthene (µg/l)	< 0.01
Acenaphthylene (µg/l)	< 0.01
Anthracene (µg/l)	< 0.01
Benzo[a]anthracene (µg/l)	< 0.01
Benzo[a]pyrene (µg/l)	< 0.01
Benzo[b]fluoranthene (µg/l) (µg/l)	< 0.01
Benzo[k]fluoranthene (µg/l)	< 0.01
Benzo[g,h,i]perylene (µg/l)	< 0.01
Chrysene (µg/l)	< 0.01
Coronene (µg/l)	< 0.01
Dibenzo[a,h]anthracene (µg/l)	< 0.01
Fluoranthene (µg/l)	< 0.01
Fluorene (µg/l)	< 0.01
Indeno[1,2,3-cd]pyrene (µg/l)	< 0.01
Naphthalene (µg/l)	< 0.01
Phenanthrene (µg/l)	< 0.01
Pyrene (µg/l)	< 0.01

OTHER ORGANICS

Phenol (µg/l)	< 0.50
Dissolved Organic Carbon (mg/l)	< 2.0

CRYNODEB

Mae'r broses a ddefnyddir gan Coatech yn hirsefydlog ac yn cael ei defnyddio'n eang.

Mae'r broses yn debyg i'r broses ail-wynebu a ddefnyddir yn gyffredinol wrth gynnal a chadw'r ffyrdd, heblaw am nifer o wahaniaethau sylfaenol

1. Resin ac nid bitwmen yw'r glynnwr a ddefnyddir gan Coatech

2. Nid proses fecanyddol yw hi ond proses o osod â llaw

3. Dewisir yr agreg a ddefnyddir ar gyfer ei liw'n hytrach na'i nodweddion technegol ac mae'n anghymesur o gostus

Nid yw pwynt 2 uchod cyn bwysiced â phwyntiau 1 a 3. Mae resin yn ddeunydd anoddach ei drin na bitwmen a fwy neu lai'n amhosib ei adfer ar ôl ei ddefnyddio unwaith.

Hefyd, oherwydd graddfa fach y gwaith, mae'r resin yn cael ei gyflenwi mewn cynhwysyddion bach sy'n golygu problem gyda'i adfer.

Yn yr un modd, danfonir yr agreg mewn bagiau 50kg ac mae defnyddio'r agreg sydd dros ben ar gynllun arall, ar ôl ei gasglu, ei olchi a'i sychu, yn dibynnu'n llwyr ar ba liw a ddevisir gan y Cleient.

Gallai trafodaethau pellach â'r diwydiant fod o fudd i adolygu unrhyw ddatblygiadau a allai fod ar y gweill gan y diwydiant glynwyr yn y dyfodol.

Mae caffael yn allweddol

- mae angen i'r Cleient gydnabod effaith negyddol y deunyddiau y mae'n gofyn amdanynt a dylid trafod opsiynau eraill.



ARGYMHILLION

Y Gadwyn Gyflenwi

Argymhellir bod pob cyflenwr cynyrrch yn ceisio cynnig ateb ar gyfer y deunydd pecynnu ar ddiwedd defnydd y cynyrrch, gan roi canllawiau clir ynghylch a ellir ailgylchu'r deunyddiau ac a ydynt yn beryglus neu beidio.

Y Contractwr

Byddai buddsoddi mewn cyfarpar sychu'n helpu Coatech a chwmniâu tebyg eraill i sicrhau bod modd defnyddio ysgubion dros ben ar brosiectau ail-wynebu eraill ac i'r un safon uchel.

Argymhellir gofyniad hefyd i ofyn am nodiadau trosglwyddo gwastraff unigol gan y cwmni rheoli gwastraff. Byddai hyn yn helpu i greu darlun clir o ran pa wastraff a gynhyrchir a'r cyfraddau adfer ar gyfer pob prosiect ac yn helpu i greu arbedion cost a bod yn fwy amgylcheddol-effeithlon yn y dyfodol.

Y Cwmni Rheoli Gwastraff

Argymhellir bod nodiadau dyletswydd gofal yn cael eu darparu'n unigol fel bod cwmniâu'n gallu cynllunio a monitro'r gwastraff sy'n cael ei gynhyrchu'n fwy effeithlon.

Y Cleient

Mae angen i'r Cleient gydnabod yr effaith y gall oedi gyda'r rhaglen ei gael ar isgontactwyr sydd i wneud eu rhan olaf ar brosiect. O bwysigrwydd arbennig yw contractwyr arbenigol y gallai eu gwaith ddibynnu ar y tywydd. Gall yr agweddau hyn gael effaith sylwedol ar yr oedi cyffredinol y mae prosiect yn ei wynebu. Caiff hefyd ei gydnabod y dylai cleientiaid fod yn ystyriol wrth drafod methodolegau eraill.



CYFNGIADAU

Deunyddiau Etifeddol

Roedd yn anodd dod o hyd i ateb amgylcheddol-gyfeillgar ar gyfer y tuniau resin. Cysylltwyd â'r cyflenwyr i weld a oedd ateb ar gyfer y tuniau gwag, fodd bynnag oherwydd y nifer fach adroddwyd na fyddai'n hyfyw i'r cyflenwyr eu cymryd yn ôl. Cyflwynodd gwmni ailgylchu ASH ateb lle gellid rhoi'r holl wastraff posib ei ailgylchu mewn un sgip a'i ddidol yn y safle gwastraff.

O ystyried natur resin, unwaith y daw cynhyrchion fel brwsys, pennau rholer, tâp ac yn y blaen i gysylltiad â'r sylwedd hwn, ychydig iawn y gellir ei wneud i'w hailanddefnyddio neu ailgylchu. Yn yr achos hwn anfonwyd y deunyddiau halogedig hyn yn syth i gael eu tirlenwi, gan effeithio ar gyfraddau ailgylchu'r prosiect.

Oedi gyda'r Rhaglen

Roedd oedi gyda'r rhaglen yn golygu bod y gwaith wedi dechrau yn y gaeaf yn hytrach nag yn yr haf fel oedd y bwriad. Ystyriwyd nad oedd y dull ail-wynebu y gofynnodd y Cleient amdanon addas i'w osod mewn tywydd gwylbyr gan arwain at fwy o oedi. Rhoddwyd gwybod i'r Cleient am y pryderon hyn a chynigiwyd dull arall, fodd bynnag penderfynwyd symud ymlaen gyda'r broses wreiddiol.

Marchnadoedd ar gyfer deunyddiau ailgylchu

Pe bai'r ysgubion agregau dros ben i gael eu defnyddio ar brosiectau ail-wynebu eraill, byddai angen eu golchi a'u sychu i sicrhau bod y deunydd yn lân, sych a di-lwch ac felly'n addas i'w ailddefnyddio.

Byddai unrhyw ddeunydd niweidiol neu leithder yn bresennol ar y wyneb yn

golygu na allai'r agregau lyny wrth y glynwr resin. Er mwyn gweld a ellid ei ailddefnyddio, cafodd ymarfer labordy syml ei gyflawni ar ffurf astudiaeth amser a symudiad i roi amcan o'r amser a'r gost o adfer yr agreg yn llawn.

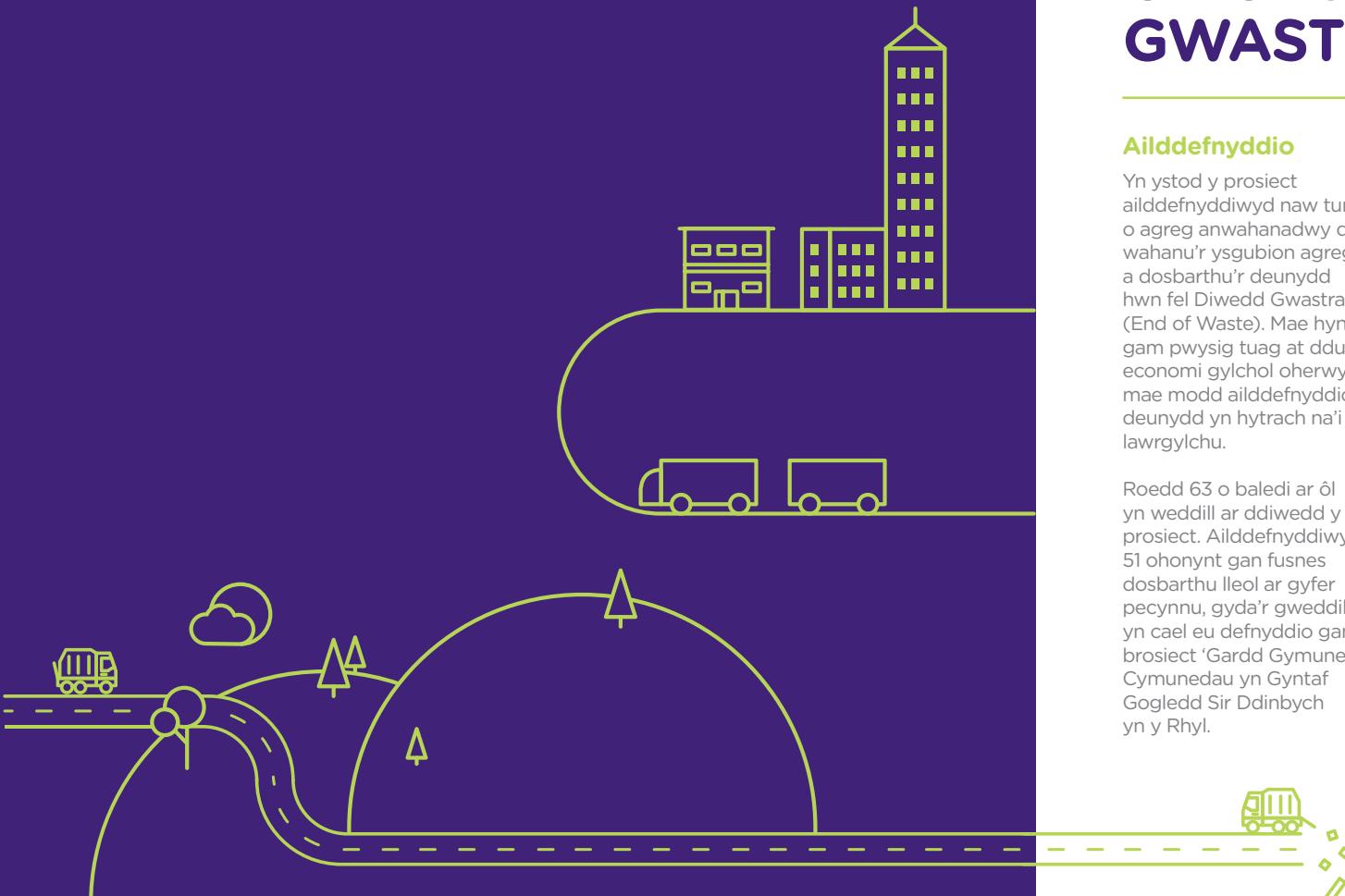
Yn gryno, dangosodd yr ymarfer pe bai Coatech neu gwmniau tebyg yn talu dros £105 y dunnell am agreg crai newydd, y byddai golchi a sychu'r ysgubion dros ben yn fanteisiol o ran cost. Rhoddir manylion llawn yr astudiaeth yn Atodiad B.

Byddai angen sefydlu pa farchnad oedd ar gael ar gyfer yr ysgubion dros ben i'w defnyddio mewn prosiectau tirlunio ac yn y blaen, i sicrhau bod angen parhaus am y cynnrych a'r meintiau oedd ar gael. Fel arall mae'n debyg y byddai'r deunydd yn cael ei lawrgylchu'n ddeunydd aggreg.

LLWYDDIANAU

- Tîm safle ymroddedig a brwdfrydig
- Deunyddiau'n cael eu gwahanu
- Wedi osgoi israddio tua naw tunnell o agregau anwahanadwy drwy wahanu'r ysgubion agregau
- 63 o baledi wedi eu hailanddefnyddio
- Wedi gwirfoddoli i edrych ar a dadansoddi'r canlyniadau diwastraff
- Meintiau bach o wastraff wedi'u hanfon i'w tirlenwi

Yn ystod y prosiect llwyddwyd i ailddefnyddio naw tunnell o agreg anwahanadwy drwy wahanu'r ysgubion agregau. Mae hyn yn gam pwysig tuag at ddull economi gylchol oherwydd mae modd ailddefnyddio'r deunydd yn hytrach na'i lawrlwytho.



DADANSODDIAD YN ÔL OPSIWN RHEOLI GWASTRAFF

Ailddefnyddio

Yn ystod y prosiect ailddefnyddiwyd naw tunnell o agreg anwahanadwy drwy wahanu'r ysgubion agregau a dosbarthu'r deunydd hwn fel Diwedd Gwastraff (End of Waste). Mae hyn yn gam pwysig tuag at ddull economi gylchol oherwydd mae modd ailddefnyddio'r deunydd yn hytrach na'i lawrgylchu.

Roedd 63 o baledi ar ôl yn weddill ar ddiwedd y prosiect. Ailddefnyddiwyd 51 ohonynt gan fusnes dosbarthu lleol ar gyfer pecynnu, gyda'r gweddill yn cael eu defnyddio gan brosiect 'Gardd Gymunedol' Cymunedau yn Gyntaf Gogledd Sir Ddinbych yn y Rhyl.



Ailgylchu ac Adfer Ynni

Adroddwyd bod y rhan fwyaf o wastraff y prosiect wedi cael ei anfon i'w ailgylchu gan ASH. Darparwyd cyfraddau ailgylchu, adfer, RDF a thirlenwi cyffredinol ar gyfer y cyfnod dan sylw, ond nid yw'r cyfraddau hyn yn ddeunydd-benodol.

Yn ôl ASH, ar gyfer y gwastraff a broseswyd dros y cyfnod dan sylw, caffodd 28% ei ailgylchu, 60% ei brosesu fel RDF, 2% ei adfer ac anfonwyd 10% i gael ei dirlenwi. Ar hyn o bryd ni wyddys a yw'r RDF yn cael ei anfon i ganolfan Adfer Ynni dosbarth R1 ar gyfer gallu dosbarthu'r gweithgaredd hwn fel 'Adfer' yn hytrach na 'Gwaredu'.

Tirlenwi

Yn ogystal â'r meintiau a adroddwyd uchod, anfonwyd 15 o bennau rwber, wyth rholyn o dâp atal, chwe rholyn o dâp masgio, 25 o bennau rholer a chant o frwsys i gael eu tirlenwi. Adroddwyd mai tirlenwi oedd yr unig opsiwn ar gyfer yr eitemau hyn oherwydd eu bod yn ynglwm â resin.

Targedau

Nod Llywodraeth Cymru yw troi 100% o wastraff adeiladu a dymchwel ymaith o dirlenwi erbyn 2050. Ni fu'r targed hwn yn bosib ar gyfer y prosiect hwn, yn bennaf o ganlyniad i'r ffrydai gwastraff oedd ynglwm â resin.

DADANSODDIAD O'R DATA

Roedd y prif ffrydiau gwastraff a gynhyrchwyd o'r gwaith ail-wynebu'n cynnwys cynhwysyddion; deunydd pecynnau; paledi ac agreg dros ben. Amlinellir faint y ffrydiau gwastraff hyn a lle y cawsant eu hanfon isod.

Cynhyrchwyd cyfanswm o 3.34 tunnell o wastraff fel rhan o'r prosiect. Nid yw meintiau a / neu dunelli'r deunyddiau penodol ar gael oherwydd nid oedd y cwmni rheoli gwastraff a ddewiswyd yn cynnig y cyfleusterau hyn.

Yr unig ddull adrodd a gynigiwyd oedd nodyn trosglwyddo gwastraff blynnyddol.

Cynhwysyddion

Cynhyrchwyd 420 o gynhwysyddion resin plastig (20L) a chaeadau yn ystod y prosiect a anfonwyd i gael eu hailgylchu yn ASH cyn cael eu hanfon wedyn i'w prosesu ymhellach yn Lloegr.

Cynhyrchwyd hefyd 420 o gynhwysyddion resin metal (20L) a chaeadau a anfonwyd i gael eu hailgylchu yn ASH ynghyd â 12 o fwcedi plastig.

Deunydd Pecynnau

Roedd cyfran fawr o'r gwastraff a ddeiliodd o'r prosiect yn ddeunydd pecynnau. Anfonwyd 84 o focsys cardbord, sef cynhwysyddion y resin, i'w hailgylchu yn ASH. Cynhyrchwyd llawer iawn hefyd o ddeunydd lapio plastig o'r bagiau agregau a phaledi, gyda'r cwbl yna'n cael eu hanfon i gael eu hailgylchu gan ASH ac ymlaen i gael eu hailbrosesu ymhellach.

Paledi

Roedd 63 o baledi ar ôl yn weddill ar ddiwedd y prosiect. Ailddefnyddiwyd 51 ohonynt gan fusnes dosbarthu lleol ar gyfer pecynnau, gyda'r gweddill yn cael eu defnyddio gan brosiect 'Gardd Gymunedol' Cymunedau yn Gyntaf Gogledd Sir Ddinbych yn y Rhyl.

Aggregates

Cynhyrchwyd 11 tunnell o agregau dros ben o ganlyniad i'r ysgubion. Defnyddiwyd pum tunnell ohono gan gwmni tirlunio lleol a defnyddiwyd pedair tunnell ohono gan brosiect 'Gardd Gymunedol' Cymunedau yn Gyntaf Gogledd Sir Ddinbych yn y Rhyl. Proseswyd y ddwy dunnell arall gan Thornciffe yn agreg wedi'i ailgylchu (SHW Cymal 803 Math 1).

Deunyddiau ychwanegol

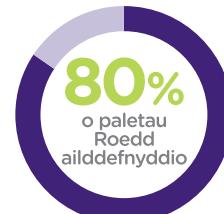
Yn ogystal â'r uchod, defnyddiwyd 15 o bennau rwber


dâp atal


dâp masgio


bennau rholer


frwsys



UWCHGYLCHU DEUNYDDIAU

Profion

I sicrhau y byddai'r ysgubion aggregau'n ddiogel i'w hailddefnyddio ar brosiectau eraill, er enghraifft fel agreg, llenwad ac i ail-wynebu ffyrdd ar ôl ailgylchu, rhoddodd CEW gyfarwyddyd i Labordy Celtest gyflawni Dadansoddiad Cemegol o Sylweddau Peryglus: Paramedrau Rhestr I a Rhestr II ar y deunyddiau anwahanadwy a gwahanadwy.

Profwyd y samplau gyda pharatoad o drwytholch yn unol â BS EN 1744-3:2002. Yna dadansoddyd y trwytholch a gynhyrchwyd yn ganfod unrhyw Sylweddau Peryglus posib a'u cymharu â mein prawf perthnasol

(e.e. Safonau Ansawdd Amgylcheddol (EQS) cyhoeddodedig, Rheoliadau Cyflenwad Dŵr 2010).

Roedd yr holl baramedrau a dadansoddyd yn cydymffurfio â'r mein prawf mwyaf llym (trothwyon EQS, trothwyon Cyflenwad Dŵr, etc.).

Roedd y crynodiadau o nifer o baramedrau organig ac anorganig yn llai na'r trothwyon canfod dadansodol.

Dangosodd ganlyniadau'r dadansoddiad fod y trwytholch a gynhyrchwyd yn cydymffurfio â'r Gyfarwyddeb Sylweddau Peryglus (DSD) (76/464/

EEC) a'i chwaer gyfarwyddebau, a hefyd y Gyfarwyddeb Cynhyrchion Adeiladu (CPD 89/106/ EEC), Gofyniad Hanfodol Rhif 3 "Hyllandid, lechyd a'r Amgylchedd". Y casgliad felly oedd nad oedd y deunydd yn cyflwyno unrhyw risg o niwed i'r amgylchedd dŵr.

Mae'r canfyddiad hwn yn bwysig o ran datblygu marchnad ar gyfer y deunydd a hefyd o ran dangos y gellir ei ddefnyddio'n ddiogel.

Mae canlyniadau llawn y profion i'w cael yn Atodiad A.

PROMENÂD Y RHYL

Hydref 2015



Mai 2016





ARFERION

O'r blaen arferid â chael sgip gwastraff cymysg i gymryd yr holl wastraff a gynhyrchwyd gan brosiect. Byddai hyn wedyn wedi arwain at groes-halogi deunyddiau ailgylchu a lawrgylchu deunyddiau a allai fod wedi cael eu hanfon i'w tirlenwi pe baent ynghlwm ag unrhyw resin.



Arferion storio blaenorol

Awgrymwyd wrth Coatech y byddai cymryd ychydig o fesurau syml, fel gwahanu'r ysgubion gwahanadwy oddi wrth wastraff arall, yn helpu i fod yn fwy effeithlon wrth ailgylchu ac adfer. Yn ogystal, ar gyfer y deunyddiau anwahanadwy, cyflwynwyd arferion lle byddai'r ysgubion agregau anwahanadwy'n cael eu rhoi i un ochr i'w defnyddio mewn prosiectau eraill (fel gwaith tirlunio) yn lle cael eu lawrgylchu.

METHODOLEG

Mae pob prosiect EZW yn derbyn cynllun gwaith / methodoleg wedi'i deilwrio. Cafodd y cynnwys ei ddatblygu gyda thîm y prosiect a'i ddylunio i wella unrhyw fesurau presennol oedd yn cael eu cymryd.

Dros gyfnod y prosiect, darparwyd y canlynol i dîm prosiect Coatech:

- Cymorth ac arweiniad ar reoli gwastraff technegol dros gyfnod y prosiect i helpu i osgoi anfon unrhyw wastraff i'w dirlenwi.
- Adnodd rheoli gwastraff penodol i ddarparu cymorth ymarferol gyda rheoli gwastraff ar y safle ac i ddarparu opsiynau / atebion diwastraff posib ar gyfer materion gwastraff yn codi ar y safle. Roedd y cymorth hwn yn cynnwys;
- Ymweliadau safle
- Cymorth rheoli gwastraff yn cynnwys cyngor ar wahanu fwy o wastraff
- Adnabod deunyddiau a ddefnyddiwyd ar y safle
- Llai o wastraff drwy annog arferion "cadw ty" da i leihau difrod
- Llai o wastraff drwy aildddefnyddio neu dddod o hyd i atebion eraill yn lle gwaredu
- Profi agregau anwahanadwy a gwahanadwy



Cafodd ymweliadau safle i gynorthwyo rheoli gwastraff eu cyflawni fel rhan o Galluogi Dyfodol Diwastraff, gan gynnwys trafodaethau â thîm y safle i siarad am broblemau safle a gwastraff, y cynnydd, atebion a gwelliannau posib.

Y prif argymhellion a wnaed ar gyfer rheoli gwastraff oedd:

- Gwella arwyddion, gwahanu a storio deunyddiau
- Chwilio am gyfleoedd i aildddefnyddio / ailgylchu unrhyw agregau dros ben i sicrhau na fyddai deunyddiau'n cael eu hisraddio
- Adnabod pencampwr gwastraff i adolygu a sicrhau cydymffurfio â deddfwriaeth a bod arferion gorau o ran rheoli gwastraff yn cael eu dilyn
- Cynnal sgrysiau i godi ymwybyddiaeth o atal a lleihau gwastraff

Roedd y cyfathrebu'n cynnwys diweddar u'n gyson drwy Twitter, cylchlythr CEW a'r wefan. Tynnwyd lluniau gyda drôn o'r awyr cyn, yn ystod ac ar ôl cwblhau'r gwaith ail-wynebu.

Y **PROSIECT**



Prosiect tir y cyhoedd oedd y cynllun ar gyfer Dawnus fel y Prif Gontactwr a Chyngor Sir Ddinbych fel y Cleient. Gosododd Coatech tua 4,600 m² o wyneb bond resin fel rhan o'r gwaith parhaus o ddatblygu'r amddiffynfeydd morol a'r promenâd ar hyd glan y môr y Rhyl.

Gwerth y prosiect oedd £75,000 gan ddisgwyl iddo ddechrau diwedd mis Mai 2015 a chwblhau canol mis Mehefin 2015. Oherwydd oedi parhaus gyda'r rhaglen, a thywydd gwlyb, ni allai Coatech ddechrau gweithio ar y safle tan fis Tachwedd 2015 gan gwblhau eu pecyn gwaith ym mis Mai 2016.

Cwblhawyd y gwaith o dan Gontact Adeiladu NEC3 (Opsiwn A).



GALLUOGI DYFODOL DIWASTRAFF

Menter Adeiladu Arbenigrwydd yng Nghymru (CEW) yw Galluogi Dyfodol Diwastraff sy'n rhoi cymorth ymarferol, cadarnhaol a rhagweithiol i brosiectau adeiladu, dymchwel a pheirianneg sifil yng Nghymru. Y nod yw sefydlu os, a sut y gall y diwydiant adeiladu gyflawni'r targedau diwastraff a osodwyd yn strategaeth wastraff Llywodraeth Cymru, Tuag at Ddyfodol Diwastraff.

Mae CEW yn gweithio mewn cydweithrediad â'r diwydiant adeiladu i geisio dirnad yn well sut y gellir bod yn ddiwastraff. Y nod yw rhannu arferion gorau, atebion a chyfleoedd ynghyd ag adnabod unrhyw rwystrau sy'n gysylltiedig â chyflawni targedau gwastraff Llywodraeth Cymru. Mae CEW yn cynnig cymorth ymarferol i dimau dylunio a thimau safle prosiectau adeiladu i ganfod atebion hyfwy i fod yn ddiwastraff a chyflawni amcanion y cynllun EZW sef;

- Deall a dangos pryd a sut y mae gwastraff yn digwydd yn ystod y broses adeiladu
- Deall y strategaethau, y methodolegau a'r cyfleoedd presennol i osgoi tirlenwi gwastraff ar safleoedd
- Dadansoddi pa mor ymarferol / ddichonadwy yw anfon dim gwastraff i'w dirlenwi yn yr amgylchedd sydd ohono
- Gweithio i ddatblygu atebion i atal a chynhyrchu llai o wastraff ar safleoedd adeiladu gan arwain o ganlyniad at orfol rheoli llai o wastraff a chostau gwaredu a thirlenwi is
- Cefnogi newid ymddygiad a phrosesau sy'n annog atal a lleihau gwastraff
- Gwneud arbedion ar y safle drwy gyfleoedd / atebion rheoli gwastraff
- Lleihau traffig ar y safle drwy gludo llai o wastraff, deunyddiau a chyflenwadau er mwyn gwneud arbedion cost
- Lledaenu atebion a chyfleoedd drwy ddatblygu strategaethau rheoli gwastraff effeithiol
- Cynnig cyfleoedd addysgl ac i ddysgu am dechnegau rheoli gwastraff eraill y gellir eu lledaenu ar gyfer prosiectau eraill yn y dyfodol gan sicrhau manteision parhaus

COATECH LTD

Mae Coatech Ltd yn arbenigo mewn gosod pob math o systemau llawr resin ar gyfer y sectorau masnachol, domestig a diwydianol.

Maen nhw'n ymfalchiö mewn defnyddio'r deunyddiau gorau gan rai o'r cyflenwyr mwyaf blaenllaw yn y farchnad gan ddarparu gorffeniad o safon a gwasanaeth proffesiynol i'w cwsmeriaid i gyd.

Mae ganddynt gyfoeth o brofiad a gwybodaeth dechnegol am ystod eang o systemau masnachol dros gyfnod o fwy na hanner canrif.

Galluogi
DYFODOL
DIWASTRAFF

ADRODDIAD GALLUOGI DYFODOL DIWASTRAFF

PROMENÂD Y RHYL



ADEILADU
ARBENIGRwyD
YNG NGHYMRU

