

Meaningful Learning Experiences

Strategic Commitment	✓	Part of a regional, ESF-funded 'Careers Local' programme
Curriculum Provision	✓	One of a series focusing on 'dry' Science topics
Employer Partnerships	✓	Major employer involvement, without visiting the school
Reflective Young People		
Informed Career Choices	✓	Increased understanding about roles in manufacturing

Tarmac cement works helps GCSE students apply learning about chemical changes

Tupton Hall School in Chesterfield asked the Science faculty to identify five curriculum topics that would provide a basis for staff development, showing how employers can bring 'dry' topics to life in the classroom. One of the topics chosen was 'Chemical Change', which includes learning about how, *'... the extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'.*

Tarmac manages a major limestone quarry and cement manufacturing facility in Derbyshire, a short drive from the school. Many students will know of the site as a prominent factory in the Peak District National Park, but be unaware of the job opportunities and production processes involved.

The company uses innovative techniques to minimise environmental impact and reduce energy consumption. The Quality Manager provided information about the chemical processes and challenged students to show their understanding about the chemical changes involved in cement production and suggest ways of further reducing CO2 emissions and use of raw materials.

Students' presentations were sent to the Quality Manager, who recorded feedback on his mobile phone while high on the manufacturing plant. The video clip was shown in the classroom and highlighted their good work, naming students who produced outstanding presentations.

Benefits for the Students

- *'You wouldn't think from a textbook that you need to be so skilled to make a product that looks quite easy – but it's not'*
- *'I'm nervous ... I want to get everything right ... all the equations'*
- *'It's harder because you have to research it yourself ... you can do it in groups'*
- *'... a bit more fun because you're not just copying from a textbook and answering questions'*
- *'It's more real because they obviously know more about it ... they are the experts'*
- I am proud of, *'How I researched the different topics and how we laid it out'*
- I am proud of, *'Working with others well and sharing information ...'*
- I am proud of, *'Working with Tarmac'*

Benefits for the School

- All five Science projects involved topics that had been described as 'dry'. The projects are exemplars for all teaching staff to see how classroom learning can be brought 'to life'
- Data showed the experience particularly helped students to, 'Learn about my individual personal skills and abilities' and 'Think about my personal choices and future direction'
- The school had not previously worked with the Tarmac site, which is an important example of a local manufacturing employer and an international business

Benefits for the Employer

- Tarmac states that, 'Sustainability is embedded at the heart of our business ... it matters because it is central to our collective long-term future'
- The project actively engaged young people in discovering about sustainability at Tarmac, particularly how they aim to reduce local environmental impact from the cement works
- Tarmac was able to have a direct impact on classroom learning in a local school and important STEM subject without anyone leaving the workplace



Cement Works Challenge

We want your help to communicate how we take care to reduce CO2 emissions and the use of raw materials




Tarmac provided information about chemical changes involved in cement manufacture at their nearby site. Students responded to a challenge to show their understanding of the processes and suggest ways of reducing environmental impact. The employer provided feedback to students from an informal video clip.

Reducing use of limestone

Substituting limestone with alternative calcium containing raw materials that are already decarbonated is an attractive option for reducing CO2 emissions.

However, the extent to which such alternatives can be used is governed primarily by:

- Composition of the conventional raw materials at the considered plant
- Local availability and cost of decarbonated raw materials
- Their composition and particularly their silica, alumina, magnesia, Sulphur, VOC or trace materials content

LC3 is a new and calcine made using abundant quantities, is cost effective and does not require capital intensive modifications to existing cement plants.

LC3 can be produced with existing manufacturing equipment leading to only marginally increased investments for calcining equipment.

This could be a possible change to make as LC3 is just as strong as Portland cement and it has reduced emissions up to 30%.