

*"I'm forever blowing bubbles
Pretty bubbles in the air
They fly so high, nearly reach the sky
Then like my dreams, they fade and die
Fortune's always hiding
I've looked everywhere
I'm forever blowing bubbles
Pretty bubbles in the air."*

***Bubble blowing
has entranced both adults
and children for generations.
The combination of the precise
spherical shape, the fragile nature
of the microscopic soap film and the
beautiful colours the bubbles create
are perhaps part of the amazing
phenomena which makes
blowing bubbles so
attractive.***

The activity of bubble blowing is an art which can be enhanced through imagination and scientific discovery. The centre for design and technology at Sheffield Hallam University in association with TEP have developed a bubble blowing machine which can provide the opportunity for pupils to explore this fascinating world of art and science through a systems and control based project.

The Bubble Blower consists of a simple vacuum formed plastic structure which incorporates a motor and impeller and a motor controlled gearbox. A bubble wand is attached to the shaft of the gearbox and rotates through a bath of bubble solution. Bubbles are produced as the wand passes through the solution and the flow of air created by the motor and impeller.

Bubble Trubble

The Bubble Blower project provides opportunities for fascinating and very entertaining product analysis activities for both pupils and teachers and an excellent introduction to the project. Through this product analysis process pupils are able to develop their 'designerly' thinking and prioritise design criteria for successful products. There are many techniques teachers could employ for pupils to analyse bubble blowing machines but imagine a group of pupils carrying out real product testing on a range of bubble machines. Pupils could be asked to consider the criteria which would constitute making the bubble blower fun to use. A simple chart could be devised with a set of questions based on the criteria.

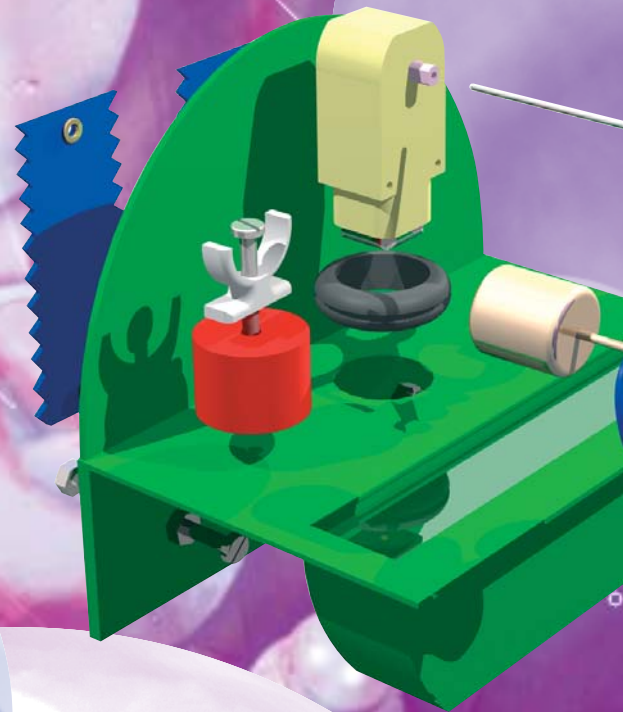
Examples of questions to ask could be:-

- ◆ How much does the machine cost?
- ◆ How attractive is the machine?
- ◆ How well is the machine made?
- ◆ How many bubbles does the machine create?
- ◆ How large and long lasting are the bubbles?

A datum bubble blowing device could be chosen from the selection. Each of the remaining products can then be judged better or worse than the datum product.

Obviously a task to be undertaken outside!

After this process pupils can derive design criteria for their own bubble blowers.





There is a whole host of inexpensive, mechanical and electrical bubble blowing machines on the market.

But it doesn't necessarily need to be a bubble blowing device from the high street. Try a ring pull on a coke can, a wire coat hanger, a tin can with both ends cut off or even a paper cone.



Bubble Technology

The Bubble Blower project provides many links with other subjects. For instance, pupils could use their science skills to investigate the bubble solution formula.

The solution used in making bubbles is as important as the bubble making device.

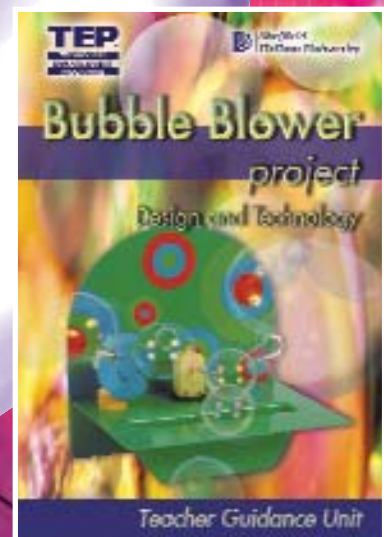
Did you ever find that when replacing the bubble solution in that little plastic bottle with just washing-up detergent and water, blowing a bubble was impossible and in its place were drips of washing detergent that spattered from the wand to your feet?

Bubble production is dependent on the correct formula and preparation. A good solution to start with is 1 part liquid detergent and 15 parts water. Anything that comes in contact with the solution should be clean. Any grease, alcohol or solid impurities left on mixing containers or bottles will affect bubble production. The water you use can also adversely affect the solution. It is best to use "soft" water. For longer lasting and larger bubbles, glycerine can be added. The more glycerine the longer lasting the bubble! The basic formula would be 1 cup of washing detergent, 10 cups of cold clean water and 4 tablespoons of glycerine is a good start. Pupils could then have the opportunity to experiment with different formulas to create various bubble properties.

Bubble Blower Project

The Bubble Blower is one of a suite of ten projects from the TEP Millennium Schools Project and supported by a teacher guidance unit publication. All the publications provide a structured approach to producing one exemplar project. However, the publications exist only as an introduction to the concepts and it is accepted that teachers will adapt and develop their own interpretation of the project to meet their individual circumstances and provide the necessary opportunities for design.

The Bubble Blower project does provide certain opportunities for pupils to develop their own individualised product and make decisions regarding scale, materials, construction, finish, structure, function and level of control. Alternative methods of control are suggested offering opportunities for differentiation and product outcomes.



BUBBLE MANIA

Continued

Bubble Blower Manufacture

The manufacturing process of the Bubble Blower provides the opportunity to engage pupils in the knowledge, understanding and making skills of a range of processes associated with plastics.

The chassis is manufactured from a sheet of high impact polystyrene which has been vacuum formed over a simple mould to create a bath for the bubble solution and then using a strip heater, the HIP's moulding is folded twice to finish the construction.

The project also incorporates a motor mounting which has ➔ been manufactured using the TEP injection moulding system

⚡ To enable pupils to personalise their Bubble Blower, CAD and a CNC vinyl cutter can be used to cut shapes into sticky backed vinyl which then adheres to the chassis.

Bubble Blower Control

There are two crucial elements in this project that are needed to create bubbles. Firstly, as already described, the correct formula of bubble solution is required. Secondly, the relative position and speed of the two motors. In its simplest form, two rheostats (variable resistors) are used to control both the motors independently by limiting the flow of electrical current. This enables pupils to experiment with variables in order to create a steady stream of bubbles.

⚡ A rheostat is manufactured using one length of card or polypropylene which has been serrated on either side using pinking shears. A hole is punched at either end of the strip. An eyelet is slotted in the hole and a length of nichrome (resistance) wire trapped underneath. The wire is wrapped around the notches of the strip and secured at the other end with another eyelet.

⚡ An MM18 motor and an in-line motor economy gearbox are linked in parallel with the power supply and the switch. M3 nuts and bolts are used as terminals. The rheostats are positioned on the positive terminals of the two motors. Crocodile clips are positioned on the positive terminal of the power supply. Moving the crocodile clips up or down the nichrome wire will decrease or increase the speed of the two motors independently.

All resources including further guidance on the construction and final assembly of the Bubble Blower can be found within the Bubble Blower Teacher Guidance publication available from Teaching Resources.

Bubble Blower Showcase

The following showcase illustrates the possibilities the Bubble Blower project can provide for design.



➔ Paul Cooper, Head of D&T at Lawrence Sheriff School in Warwickshire taught the Bubble Blower project at the beginning of Key Stage 4 and used it as an introduction to GCSE Systems and Control. Students experimented with the use of monostable circuits and the IQ board for control purposes.

Chris Canavan, Head of D&T at Foremarke Hall, worked with a group of Yr 8 girls on the project. The Bubble Blower chassis was redeveloped slightly with a small plastic panel placed just beneath the impeller at the front to control the air flow through the wand. Two 470 ohm potentiometers have replaced the rheostats and are being used as variable resistors to control both motors. A wooden box was also devised to hold the chassis for added support.



The 'Hubbly Bubbly' girls constructed fantastical 'stage sets' around the chassis using a variety of layered coloured acrylics, frosted Perspex and painted MDF. Lighting was also incorporated using ultra bright LED's to create dramatic visual effects.

➔ Chris Canavans exemplar Bubble Blower



Millie Karlsen presents ➔ the Red Dragon



➔ Georgie Chamberlaine presents the Pink Elephant



Romy Welch ➔ presents the Cat on the Pedestal



➔ Taimer BIRTHISTLE-COOKE and the Bath Tub

Lauren Bond ➔ with Pictures



➔ Sophie Politowski presents the Lovers on the Beach



➔ Rebecca Wilson presents the Rainbow

You can find more about bubble blowers and bubble blowing, its history and technology on the internet on the following websites:

<http://bubbles.org/html/history/toyhistory.htm>

<http://www.zurqui.co.cr/crinfocus/bubble/bubble.html>

<http://www.bubbleblowers.com>

