TPOP Education Web
Summary

Tetra Pak is manufacturing and selling filling machines for the liquid package industry all over the world. From the interactive control panel TPOP (Tetra Pak Operating Panel) the machine operator runs and supervises the machine. Tetra Pak wanted to get some kind of web-based multimedia training session developed.

We have tried some different multimedia tools and made a structure for a web-based TPOP education site. Macromedia Dreamweaver has been used as the web site designer tool. The animations are made in a vector-based program, Macromedia Flash, and they are “language neutral”, to make it easy to translate the education site to different languages.

All the paths in the TPOP education site are made so that it would be possible to move the site to a CD.

In this report you can read more about the programs that we have used and see samples of pages that we have produced.
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Company presentation

Tetra Pak develops, produces and markets complete processing, packaging and distribution systems for liquid food stuffs. The most common of these are milk, juice and juice-based drinks. The range of processing equipment offered by Tetra Pak includes separators, homogenisers and heat exchanger. Tetra Pak also offers eleven packaging systems for pasteurised and aseptic products. In addition Tetra Pak markets a range of conveyors, tray packers, shrink-film packers and other distribution equipment. Tetra Pak operates world-wide and their products are sold in 150 countries. 1995 Tetra Pak had 18000 employees, 3400 of them in Sweden.

Background

Tetra Pak is manufacturing and selling filling machines for the liquid package industry all over the world. The amount of different machines increases all the time. In order to make the filling machine more user-friendly and to facilitate the communication between man and machine, the machine is equipped with a interactive control panel, TPOP (Tetra Pak Operating Panel), with touch screen. From the TPOP the machine operator runs and supervises the machine. This new type of interactive control panel is more or less self-explanatory. But for persons who have no, or little experience of computers and interactive programs it takes some time before they understand the TPOP concept and hence are capable to operate the filling machine.

Some attempts to explain the TPOP concept have already been made, mainly as paper-based information. However, Tetra Pak’s experience is that it is very hard to explain the function of the TPOP in the traditional paper based way.

For that reason Tetra Pak wanted to get some kind of web-based multimedia training session developed, where the operator can work with a TPOP-simulator without having access to the real filling machine. The intention is to make the operator familiar with the TPOP.
**Work description and purpose of the work**

The aim was to develop and start to produce an interactive multimedia program, intended for:

- Training on what a TPOP is
- How it interacts with the operator/machine
- What happens in the machine when the operator presses a button

The program had to be easy to translate into different languages and it should be possible to run the program over Internet and on a CD.

**Implementation**

We had the first contact with Lennart Christenson, Tetra Pak Research and Development AB, in December 1997. After some meetings together with Lennart Christenson, Lars Lindmark, Christer Mårtensson and Johan Fridolf we started to find the shape of this examination work.

Christer Mårtensson was chosen as our superintendent and we also decided that we were going to spend most of the time working at Tetra Pak in Lund. In the period from the middle of January to the end of March we were at Tetra Pak once a week and from April to beginning of June we were at Tetra Pak every day. At the beginning we spent most of the time finding out what Tetra Pak wanted and how it was possible to realise this. We also spent time trying different programs, Microsoft FrontPage, Macromedia Authorware, Macromedia Director, Macromedia Dreamweaver and Macromedia Flash.

We have spent days trying features in the different programs and it has taught us and Tetra Pak a lot. After we had decided what programs we were going to use, we started to build the “TPOP Education web”. We decided to use three different stages in the web site.

- **Guided Tour** to explain what a TPOP is and how it interacts with the filling machine. This part should be something that the user will pass without doing much himself.
- **Learning** will give the user possibility to interact with the education program and the users will be pushed to do what the programs ask them to do.
- **Simulator** will make it possible for the user to “run” the machine.

We have made some samples of pages in Guided Tour and Learning, but we have not done anything in the Simulator.
Choice of multimedia programs

General
When this examination job started nobody really knew where it would end up. We had discussions about whether we should use the program In-Touch and through Visual Basic create a type of simulator, or use a separate “stand-alone” multimedia platform. There were advantages and disadvantages with both methods.

With In-Touch it could maybe be easier to update the simulator but on the other hand small changes in In-Touch could make the simulator impossible to use without changes. Another disadvantage is the fact that there isn’t a possibility to put the education site to a CD for users without Internet connections, and that users need to have special programs to be able to run the simulator.

The “stand-alone” multimedia platform has the advantages that, except for a 4.0 web browser, no extra programs are required. The education program would not be effected by changes in the PLC, it means that the program is still working but without the changes. The program can also easily be moved to a CD.

After a while we decided to go on with the multimedia platform. The first thing we had to find out was what programs we were going to use. We found that Tetra Pak normally used Microsoft Frontpage but they gave us the possibility to choose the programs we thought would be the best for this job. Because we have used Macromedia’s multimedia tool Director before, we decided to contact Macromedia’s distributor in Sweden, Studentlitteratur in Lund. Jacob Welin, Studentlitteratur, spent an afternoon showing us Macromedia’s Authorware, Director and Dreamweaver.

In late autumn 1997 Macromedia presented a new multimedia tool, Dreamweaver. The advantages of this program is that it is a visual web development tool without any loss in control over the HTML source and that it can animate HTML elements without scripting, thanks to support for Dynamic HTML. We decided to use Macromedia Dreamweaver as our Web site designer.

At first we focused on Authorware as the best program, because we would like to have the possibility to have a log-file, so that we should be able to have a type of examination at the end of the education program. This opportunity was later not something that Tetra Pak really needed. Then Director came up as a strong candidate, because our earlier experiences in that program. With this program you have the possibility to produce Streaming Shockwave files that start the animation much more quickly. A 200 kB file that normally takes approx. 60 seconds before it starts the animation, will with Streaming Shockwave start after some few seconds.

In the end we looked at Macromedia Flash, that is a vector-based animation program. In Flash it is possible to create animations, buttons, graphics and sounds. Flash creates compact, interactive web interfaces and thanks to Shockwave Flash the download delays will be reduced to a minimum. To be able to run Shockwave Flash the user needs a shockwave player, that is a free plug-in available on Internet. Flash animations stream over the Internet, begin playing as soon as the first frame downloads, and resize onscreen with no loss of quality. We found Flash very interesting and we decided to go on with it as our animation tool.
Macromedia Dreamweaver
Dreamweaver is an authoring tool for creating and managing web pages. One of the advantages of the program is that it imports HTML documents, created with other authoring tools, without reformatting the code. Dreamweaver also makes it possible to use the Dynamic HTML features like animated layers, behaviours, and style sheets without writing any code. All of the code generated by Dreamweaver, even dynamic HTML, works on common platforms and browsers. It is also possible to check the result with a Browser-targeting function which lists possible problems on common platforms and browsers.

The visual workspace for creating HTML documents is shown in figure 1.

Figure 1
1. Document window which displays the information approximately as it will appear in a browser.
2. Launcher to show and hide various palettes and inspectors.
3. Object palette to insert images, tables and other objects.
4. Property inspector which views an object’s properties such as alignment, colour and link.
From the launcher several palettes and inspectors can be chosen. In this report we want to explain further about the HTML source, the timeline and the behaviours of a component in the document window can be given. In figure 2 those sub windows are open.

Figure 2

1. HTML Source window. It is possible to work either in the HTML source window or in the document window. HTML code that is created in another editor can be imported without any reformatting of the code.

2. With timelines it is possible to create animation without using any ActiveX controls, plugins, or Java applets. Timelines use Dynamic HTML features to change the properties of layers and images in a series of frames over time. Timelines work only in 4.0 or later browsers. Timelines create animation by changing the position, size, visibility, and stacking order of a layer. Timelines are also useful for other actions that occur in time after a page loads. For example, timelines can change the source file of an image that is not in a layer and they can execute behaviours at a particular frame.

3. A behaviour is a JavaScript element that makes objects interactive without scripting. A behaviour is a combination of events and actions. When creating a behaviour, you specify an event that triggers an action. You can associate several actions with a single event.
Macromedia Flash
Macromedia Flash is a vector-based animation editor. That is, the program retains a mathematical description of each shape. Flash makes it possible to create full-screen interactive animations that are as small as GIF-files. In the following part of the report we will describe how to create those interactive animations. Each Flash movie consists of one or more scenes. Each scene can contain a static image, or an animation. You can think of a Flash movie as having one film sequence, or series of frames, per scene. Each scene consists of one or more layers, similar to a stack of transparent paper. All drawing takes place in the active or current layer. Elements drawn on different layers are separate—they do not connect to or segment each other. However, elements moved over elements on others layers connect and segment each other.

You can manipulate artwork on any visible, unlocked layer. Select, reshape, and modify items residing on layers other than the current layer or cut, copy, and paste graphic elements from one layer to another.

One of Flash's optimization features is to store some kinds of elements in a movie only once. These elements include symbols, buttons, sounds and bitmaps. They are stored in Flash's Library.

Symbols
A symbol is a unique type of overlay. Similar to a group, a symbol is a distinct object that can be composed of shapes, groups, and even other symbols. Symbols can also incorporate animations and interactions. Most importantly, each symbol is stored in a Flash movie only once, regardless of how many times it is used.

To use a symbol in a scene of a Flash movie, you create a link to the symbol. Each link can look and act like a separate overlay, but changing the symbol automatically changes the all the links to that symbol. Changing a link, however, does not change the symbol. You can place links anywhere throughout the movie.

Buttons
A button is a type of symbol that incorporates interactivity. Each button is comprised of a four-frame animation; each frame has a mouse event associated with it.

Sounds
Imported sounds are not literally symbols but they are stored in the library. Like symbols, you can create links to all or part of one sound file any number of times throughout your movie and Flash saves only one copy of the sound file.

Bitmaps
Although they are not symbols, bitmaps are stored in the library. If a bitmap is duplicated in a movie, Flash stores the bitmap only once to reduce file size.
The visual space for creating Flash movies is shown in figure 3.

1. Work-area where you create graphics and text with the built-in tools. Here it is also possible to import bitmap pictures. In the work-area you can see the layout frame by frame.
2. The timeline is used to create and organize the frames, layers and scenes of a movie.
3. Scene-tabs where you can change between the different scenes in the movie under the construction phase.
4. Drawing toolbar.
5. Library where all elements as symbols, buttons, sounds and bitmaps are stored.
Methods
Language and links
When we started we had some wishes to consider. For instance that the TPOP Education program should be easy to translate to different languages and that it should be possible to run the program over Internet and on a CD.

To make it easy to translate the program into different languages, we decided to try to make all the animations “language neutral”, that is to say no text in the animations. To shows the texts we let the animation file call for the specific text and place it in a text frame on the web page.

To be able to explain this we need to show how we have built up the frame set of the page. The home page is built up by three frames, LOGO, CONTENT and MAIN, see figure 4.

- LOGO is just a static frame that will always contain the text “Tetra Pak TPOP Education” in current language.
- CONTENT is the frame where you navigate through the education site. Here you find the menu where you can make your choice.
- MAIN is the frame where it all happens. When you have made your choice in the menu in CONTENT, the MAIN frame will be loaded with a new frame set in it, see figure 5.

The new frame set that starts in MAIN can for instance look like the one above with HEAD, DISPLAY and TEXT.
An example of what a page can look like is the one in figure 6 below. The text “Alarm Groups” in the HEAD frame is static. In DISPLAY the animation is running and the text in TEXT is controlled by the animation.

This means that we have to let the user select language at the beginning of the program. After this choice the user will work just in this “language directory” for instance English, and then all the calls from the interactive animation will be made relative in the directory. This means that the call from the animation file, for instance for the text “Group_txt01.htm”, will load the file “Group_txt01.htm” that is in the current language directory. The text file “Group_txt01.htm” will contain English text when in directory English and Swedish text when in directory Swedish. See figure 7.

At first we thought that it would be possible to have all the animation files in one directory and from each language directory call for the animation. The advantage with that was that we would need just one copy of the animation file. The problem with this solution is that the animation file calls for the text file relative from where the animation file is and not from where we called for the animation file. For that reason we need to have a copy of every animation file in each language directory.
Figure 7

As described above the links are written relative, which means the program will look after the file from the level in the program where you are right now. The other method is to write the absolute link “D:\InetPub\wwwroot\TPOP_web\English\Guided_Tour\Alarm\Group_txt01.htm”. It is not possible for us to use absolute links, for two reasons. The animation file must call for the text file in the current language directory and the TPOP Education program must be able to put on a CD.

**Graphics**

We have got most of the graphics that we used, direct from the program In-Touch. As they were bitmaps we used Adobe Photoshop to translate them into JPEG and GIF, because these formats gives much smaller file sizes. Macromedia Flash then converts JPEG and GIF graphics to vector-based graphics. Later we found out that it is perhaps better to use bitmap graphics direct and import them to Flash. In Flash there is a function “Trace Bitmap” that converts pixel-based bitmaps into resolution-independent vector-based graphics. This method gives smaller animation files and a better quality in graphics.
Comments to the layout of the web pages
As described under Methods, each page consists of a frame set with 3-6 frames. The frames at the left of the screen are shown in figure 8 below.

![Figure 8](image)

Here you can click on either Guided Tour or Learning or Simulator. When you have chosen one of those, a new menu comes up. An example is shown in figure 9.

![Figure 9](image)
If you then chose “Alarm” an new menu with the lesson connected to alarms comes up. See figure 10.

![Figure 10](image)

When you choose for instance “Groups”, the lesson in Guided Tour that explains the different alarm groups will start in the frame MAIN. This means that during this lesson there will be three frames in frame MAIN. There will be HEAD, DISPLAY and TEXT. In DISPLAY a Shockwave Flash animation will be loaded and in HEAD and TEXT text will be shown. See figure 11.

![Figure 11](image)

The menu at the left gives a good overview of the user’s position in the web site. It is easy to see the lessons that are available. To the right at the bottom of the animation there are three navigation buttons. See figure 11. The buttons that are ineligible are softened but still visible.

When pressing the buttons to the left (back arrow) the program will take one step back and repeat what it has just shown, the middle button (up arrow) will start the current lesson from
the beginning and finally the right button (right arrow) will go on in the current lesson. See figure 12.

![Figure 12](image)

The lessons are made so that when the user presses the right button the animation starts, the text in frame TEXT disappears and the buttons are softened. Then when a sequence of the animation is played the animation stops, the current text will be displayed in frame TEXT and the eligible buttons are not softened anymore. Before the animation starts again the user has to press the right button again.
Example of a lesson
The best way to show this is of course on a computer. But we will anyway try to give a feeling of what a lesson in TPOP Education Web looks like.

To better demonstrate what the user will see in this web-production we have put together a sequence of pictures from Guided Tour. In figure 13 the user has accessed the English homepage and has the opportunity to choose between the main parts Guided Tour, Learning and Simulator.

![Figure 13](image)

In figure 14 the user has opened the submenu in Guided Tour. It is possible to choose between a lot of headings that will give a lesson about a part of the TPOP.

![Figure 14](image)
In figure 15 the user has chosen the heading “What is TPOP”. When this selection is done a Flash movie appears in the window. Below the animation, a picture caption will be displayed. The user can now navigate through the movie with the accessible navigation buttons.

![Figure 15: TPOP Tetra Pak Operator Panel](image)

“TPOP Tetra Pak Operator Panel”

When the user presses the next button the Flash movie plays to the next stop in the movie. When the movie reach this stop a new picture caption appears (figure 16) The user has the opportunity to step back in the movie with the previous button as many steps as wanted. In the following pictures (figure 16 - 23) each stop in the movie “What is TPOP” is shown.

![Figure 16: The TPOP is the operators instrument to communicate with the filling machine and its equipment](image)

“The TPOP is the operators instrument to communicate with the filling machine and its equipment”
Figure 17

“The TPOP consists of a screen and hardware-buttons”

Figure 18

“We will tell you more about the TPOP panel and its parts further in this education guide”

Figure 19

“The TPOP communicates with the filling machine via a PLC”
Figure 20

“The PLC communicates with different components in the filling machine, e.g. servomotor”

Figure 21

“As an example on this communication we will let the TPOP start the servomotor”

Figure 22

“Wow! It works”
Conclusions
To have the possibility to offer customers a web-based education program, is something that can be a great advantage, for both the company and the customer. It can be hard to explain the functions of the TPOP on the traditional paper-based way, because the TPOP interacts with the operator. In the web-based education there are the possibilities to, except text and pictures, have animations, videos and even sound.

Comparing with the paper-based way to educate, we have just seen the beginning of the web-based way. The development is very fast, better and easier programs that gives smaller files, high speed communications and so on.

During this examination work we have got the feeling, that the web-based education program that we started to produce, is something that Tetra Pak really want to have. We have got a great support from Tetra Pak and we hope that this examination work will help them in the future.