The Design of Microscopes: Principles, Aesthetics and Ergonomics

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INTRODUCTION
If you thought aesthetic and ergonomic design was the preserve of consumer products, think again. With major microscope manufacturers putting design at the forefront of their new product ranges, there’s a design revolution going on in the microscope sector. So what’s the point of bringing a design element to products that are barely seen beyond the laboratory?

Firstly, design plays an important part in understanding the end user and making products simple and effective to use. If you pick up a product and immediately know how to use it, that’s because the design has made it intuitive to do so. If a product’s comfortable to handle that’s because it’s been designed to be ergonomic. With more and more designers understanding the technical as well as the aesthetic aspects of design, good design can not only delight and surprise customers, it can also save money, such as through choice of materials or production processes (particularly with scientific products, as often production runs can be very small). The wrong design on the other hand can be costly, difficult to manufacture and turn away potential customers who may choose a competitor’s product instead.

Secondly, aesthetics. Design is in every part of our lives, it’s on the national curriculum, it comes into every product we chose as consumers, so it is inevitably making its presence felt in other markets such as technical products. If two products are identical in every way, nine times out of ten a buyer will choose the most aesthetically pleasing one because we are all used to looking at good design. For manufacturers, this is a way to compete and really make their product stand out from the crowd and sell off-the-page.

However, the move to bring design to more technical sectors hasn’t been plain sailing. As designers we are very used to caution from a technical audience who can be suspicious of designers: the traditional view is that design-ers are ‘felt-tip fairies’, producing things on paper that won’t work in reality. But if you can show that what you put on paper can be delivered technically – and have a technical approach and understanding – the doubters are usually put right. Our designs are always realistic and we develop a chosen concept through to design for manufacture.

It used to be common for engineering directors to say to me, “We don’t need design, why can’t we just have a box?” yet these same people were driving stylish cars, using designer gadgets and filling their home with well-designed products. This type of comment is now very rare.

CREATING DESIGNS
So how do we go about creating these designs? Although the microscopy sector’s move towards more interesting design is following the lead of consumer products, the actual process of creating the design is very different. We can’t just create eye-catching looks that will have great appeal but won’t allow the product to do its job. We need to balance good design with technical requirements. We achieve this by working closely with clients and their engineering and marketing teams and by listening to feedback from potential or existing users. These products are usually highly technical and innovative, so we can’t simply draw on what we did last time. Advances in manufacturing technologies have also opened up more possibilities for product design in terms of materials, production processes, form and ergonomics.

Most companies that come to us are looking for a design that emphasises what’s new and unique about their product. Often they haven’t used designers before, but maybe have a new product that they are excited about and want the design to match the advances in technology just surrounding the internal mechanisms with a cheap box isn’t going to achieve this. Taking into consideration technical restrictions, we like to inject some excitement into the product but at the same time ensuring that the client knows what the product will be made out of, how it will be manufactured and, most importantly, what it will cost.

A TYPICAL DESIGN PROJECT: THE PHASES

Product Specification
A new project begins with a product specification; we will often work with a client to prepare this document. The specification should include technical and environmental issues, such as the recycling of components, and also should define the relevant standards to which the product should conform. After detailed planning and identifying key milestones, we generally approach a new project by brainstorming ideas with the client and undertaking research into competitor analysis and product trends.

Concept Designs
We usually show a minimum of three concept designs: one safe with a conservative approach, one in the middle that gives the product an up-to-date feel, and one radical design that can make the client re-evaluate some ideas. Often ideas come to us about dif-
ferent materials or processes while we are working on a design; customers can often feel braver about choosing a more advanced design when they can see what it will actually look like and achieve.

Once an initial concept has been agreed we move on to the Detail Design Phase which involves 3D CAD models of detailed parts, exploded views and a full Bill of Materials (BOM). At this stage we can also undertake mould flow analysis, finite element analysis (FEA), interference detection and draft checks. We also recommend that rapid prototypes are built for test and approval.

Design for Manufacture is the next phase, which includes production support, vendor selection and documentation. At any stage of a project we can bring reality to the design through a free eDrawing viewer which allows a client to spin and interrogate our 3D CAD designs and photo-realistic visuals that can be used in publicity or marketing adverts.

**Graphical User Interface**

Another area that is critical to a product’s success is the graphical user interface or GUI. This includes the design and detail of the correct display technology and encompasses the design of icons and visual feedback. Our aim is always to design symbols and graphics that create a simple-to-use and intuitive interface.

**Ergonomics**

Ergonomics feature heavily in microscopy based products and so, to ensure a product is as ergonomic as possible, we undertake user studies, accessing and applying our archive of human anthropometric data to specific applications. Often the best designs can be adjusted to suit various sized users and bench positions.

Good access to sample loading is also key in many applications. This can mean designing innovative door mechanics to maximize space and can also include creating an integrated and unified loading bay, something that is a ‘joy’ to discover.

**SCANNING ELECTRON MICROSCOPE**

The increasing importance of design in the microscopy sector is evident in the EVO range of scanning electron microscopes from Carl Zeiss SMT (Figure 1).

Most of the other products in the market are very functional-looking so Carl Zeiss decided to inject some strong styling to improve the aesthetics and enhance their high-end brand positioning. What we have produced for them is bolder and also incorporates lighting for the first time. We worked closely with the marketing and engineering departments at Carl Zeiss...
to develop an advanced and eye-catching aesthetic with an almost automotive design quality. With a number of bolt-on devices included in the product (such as electron and X-ray detectors and spectrometers, tensile stages and CCD cameras) the design could have had a fragmented look. But a large-scale moulded housing gave the design an integrated look.

The EVO range posed a number of technical design challenges, one of which was to make the design scaleable to three differently sized machines in the range. This was achieved by using modular tooling to allow parts to be extended easily whilst keeping costs to a minimum. Careful consideration was given to the development of the column illumination and a number of materials and finishes were explored to create the correct ethereal glow to make the machine ‘come alive’. We also looked at elements that were not crucial to how the product worked, but made using it more convenient, such as improving cable management through a dedicated cable shroud that mounted onto the door and unified with the overall architecture. We also worked on the instrument tabletop, adding curved edges to create a flowing S-shaped ledge to wrap around the user. The user might not notice all these design decisions, but they’ll find a product that is easy and comfortable to use.

Although Carl Zeiss is leading the way in bringing design to scanning and transmission electron microscopes, there is still a way to go. Styling is becoming ever more important for scientific equipment, even though some companies remain cautious and conservative because too radical a design could limit their market potential. The introduction of lighting, for example, raised a few eyebrows. When the equipment is running, part of the covering is lit instead of a simple button or software toggle. This is seen in some quarters as appearing a little gimmicky, despite the fact that it serves a function.

X-RAY INSPECTION SYSTEM

It was a similar story for X-ray inspection systems manufacturers Dage (Figure 2). Until recently, its customers just wanted to know whether a product did the job it was supposed to. Dage had previously reported that no one worried about what it looked like, but now there’s much more emphasis on the external design, particularly in Europe. Until we came along, Dage’s design had been in-house, but they wanted some input to move it along.

At the launch Dage found that people were commenting on the looks of the XIDAT XD 7600. They were pleased to have a product to show that was a bit sexier than every other box on the factory floor. Dage has exceeded their customers’ expectations with the XD7600 and has set the mark to which all others will be measured. People were commenting on the looks then asking Dage to show them how it worked. Previously they would have just asked how it worked. Whereas functionality and price were previously the only areas of interest, design is now an important factor when buyers are choosing microscopy products.