

Laura Knights, Environmental Health and Safety Facilitator at Textron, looks at the health and safety issues in the design and manufacturing of modern turf maintenance equipment and in the great number of safety procedures involved in making safe products...



Safety in numbers



Above: The Unigraphics CAD system helps design safety features in the early stages of new product development

With the highly competitive markets of today, the design of new machinery and the continued improvement of established models is all important to companies vying to remain in the forefront of the turf care market. Not only do products have to provide quality and functionality, they also have to be increasingly safe in operation.

With safety now high on the agenda and European legislation on machinery safety tightening, the designers and manufacturers of turf care equipment have to be ever tougher in incorporating all aspects of safety into their products.

Textron Turf Care and Specialty Products are one of the market leaders in the manufacture of turf care and grass cutting machinery with a UK manufacturing site based at Ipswich in Suffolk. As one of Textron's seven design and manufacturing Centres of Excellence dedicated to both the golf and municipality markets, we know only too well the tough stance needed on safety. We have been designing and manufacturing grass cutting machinery for the last 160 years and have witnessed the increasing requirement for safe machinery that must now comply with tough European standards.

The team of design engineers at Textron work to the principal British Standard on safety of lawnmowers (BS EN 836 : 1997 - Garden equipment - Powered Lawnmowers - Safety) when designing new products or bringing existing products up to the high level of both performance and safety that is now required and expected.

The process begins with the 'Product Definition' stage derived from the marketing side of the company. This stage charts the requirement for a new product to fit a market niche or for an existing product to be improved and is the birthplace of new

ideas. At this stage there are few safety aspects taken into consideration, as the key aim at this point is to identify and conceptualise potentially new or existing product development opportunities.

The 'Product Definition' will pass from marketing to the design engineers who really begin to move the project forward. They will effectively answer marketing's proposal by looking at the viability of the project, what can realistically be achieved and delivered whilst maintaining all the aspects of performance, quality and safety. If it is agreed that the project is viable and financially attractive then the design team will progress with the project plan and begin working through the design stages. It is at this point that the safety aspects come into play.

Working with the guidelines set down in BS EN 836 the conceptual, layout and detailed design stages will incorporate all the required safety aspects into the design or re-design of the product. The British Standard includes aspects on almost every conceivable safety issue including guarding, access to hot surfaces and power driven or cutting means (blades etc.), as well as the associated noise and vibration levels. It is fundamental that the stringent safety requirements are fully achievable in the final product and using the computer aided design (CAD) system 'Unigraphics', which is also used by the aeronautical industry, throughout the design phase means that these requirements are being realised at an earlier stage in the project. Previous-

ly, using traditional design methods, it was often at the later prototype stage that unacceptable safety issues became apparent. Now with the 'Unigraphics' system utilising 1:1 scale three-dimensional modelling, more of these issues can be identified and rectified at a much earlier, and less costly, stage.

Once the product has reached the end of the design stage the scene is set to begin the prototype work. Textron have in-house manufacturing and experimental production capabilities at Ipswich allowing the new or redesigned product prototype to be built on site. With the progression into the actual manufacture of parts and the building of prototypes the safety aspect of the project takes on a different twist; that of safety during production. Obviously health and safety not only applies to the machinery itself during its use but also there are safety implications to be taken into account during the manufacture of the machine. With any new production job there is the potential for unforeseen hazards. To help minimize these the project team is multi-disciplinary, with members of the manufacturing and assembly departments taking an active role in the pre-production stages to help identify and rectify any potential hazards in the production process. This along with Textron's strong stance on health and safety in the workplace means that the prototype can be made as safely as possible.

Full scale, fully functional prototypes will be built and it is at this point that the first part of testing and

approval for European and other legal requirements, including vital safety requirements, begin in earnest. The machine will undergo a rigorous testing regime by the in-house test team who look at safety aspects in line with British and European safety standards.

All aspects are covered including - guarding, rotating blades/shafts, safety signs/labels, hot surfaces, exhaust fume protection, noise and vibration levels and OPC's (operator presence controls) that prevent the machine being operated or continuing to operate in the absence of an operator. This series of tests will highlight areas of concern and a report detailing all the areas where further action is required is passed back to the project team by the test team.

This process will continue, with adjustments and improvements in the design followed by further testing, until all involved are happy and the machine meets all the stringent safety standards required.

Only when we're happy with the results of these tests, are the product prototypes sent for further testing in an end-user environment to further identify any issues on all aspects of the design, including safety. Following feedback from customer trials some further changes may be made but essentially the next stage will be to enter into pre-production. Again the safety hazards of production are reduced by the strong stance on health and safety taken within Textron Turf Care combined with the involvement of manufacturing personnel in the multi-disciplinary project team.

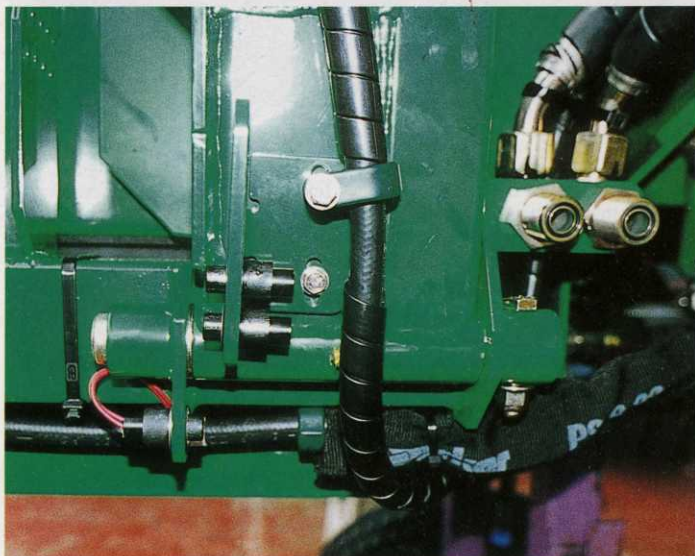
Before full production and product launch, all safety aspects relating to the use, maintenance and servicing of the machine have to be scripted in the accompanying technical literature. This gives the end user essential information on how to use and maintain the equipment including the operators handbook, parts and maintenance books, product service information, etc. In fact, everything that is required to ensure the safe use of the machine.

It is then time to launch the new product into the marketplace where the duties are handed over to the marketing department. Following the sale of the equipment the responsibility for safe operation transfers from the manufacturer to the purchaser and for readers this is the nub of this article. There has been stringent adherence to all the necessary guidelines, directives and legislation throughout the entire production process. The compilation of the operators handbook, service information

Right: New wheel lifts save technicians the task of lifting rim and tyre assemblies

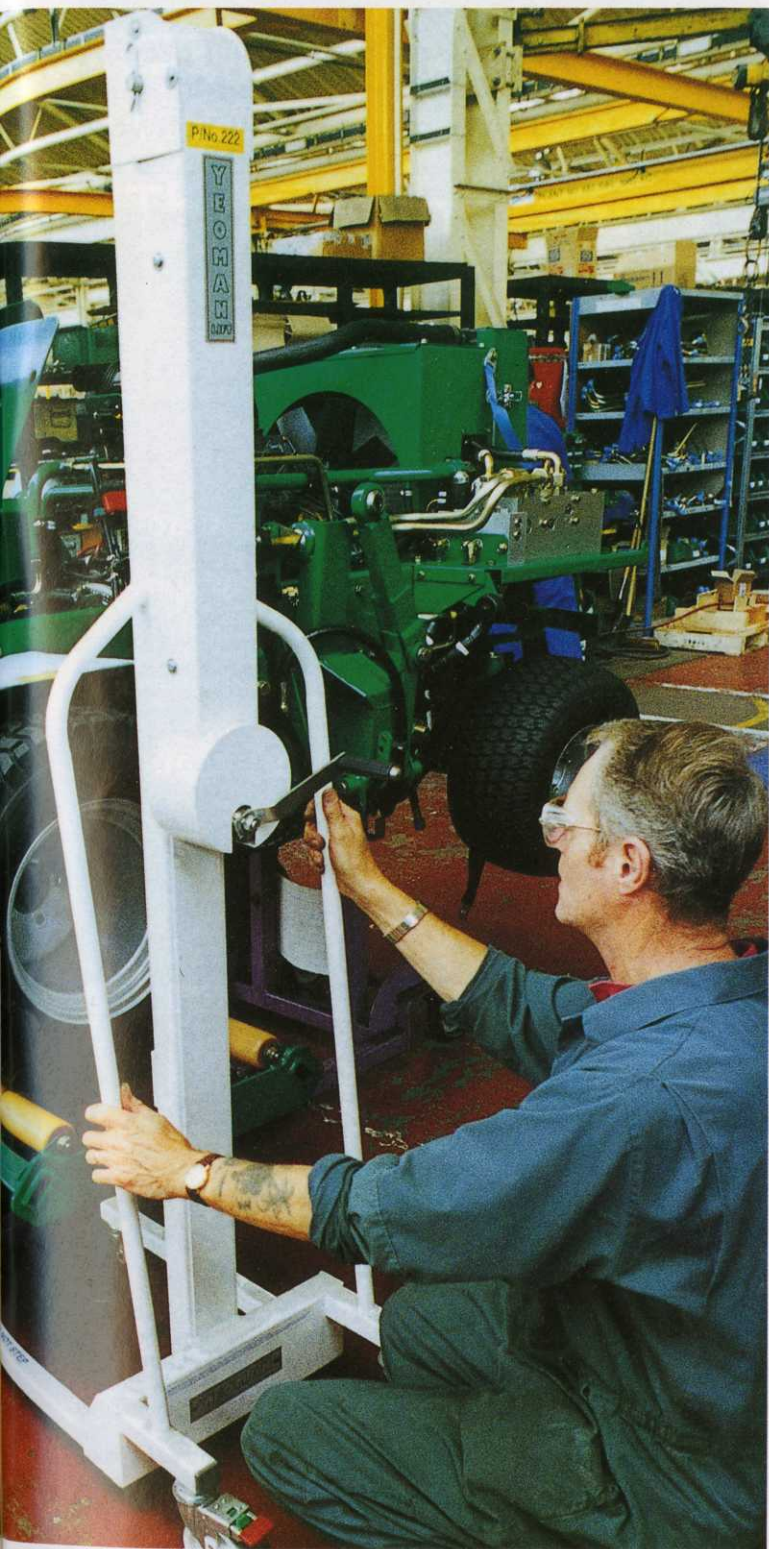


Below: Operator presence control (OPC) prevent cylinders turning when lifted from the cutting position, thanks to proximity switches



and other technical literature is an integral part of that process, therefore it is essential that end-users not only read the information, but fully understand how the equipment can be used to ensure that it is operated safely. Our nationwide dealer network and our training department at Ipswich offer training courses to ensure that operators are fully conversant with all health and safety matters related to the safe operation of our equipment.

With standards relating to safety of machinery ever changing and tightening it is essential that companies pre-empt future new standards or legislative amendments. Two safety aspects where the law is set to tight-



en further are noise and vibration. Currently the legislation on noise states that machinery has to comply with certain set bystander and operator noise levels aimed at protecting the operator and people in the vicinity. However, stricter regulations look set to reduce these maximum noise levels further along with tightening the frequency of noise testing. Unlike noise, the current requirement on vibration levels dictates only that these levels have to be stated in the operator manual. There are no upper or lower vibration limits with which equipment must comply, only recommendations for the length of time a person should use the equipment. Again this looks set to

change with tighter regulations governing vibration in the pipeline.

It is the pre-empting of this type of change that allows Textron Turf Care and Specialty Products to remain ahead in the market. We are already anticipating and working towards these changes by researching all aspects of the products to further reduce noise levels, ensuring that they will meet the proposed stricter standards and looking at improved product design that will reduce vibration levels thereby ensuring that we are on top of any changes here. Safety is the number one priority at Textron and is incorporated into all aspects of our business ensuring that our products have safety built into them every step of the way.

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