Purchasing a new shear baler to compact, cut and process scrap metal can be a complicated matter. The selection process involves gathering technical information and performance statistics from the large number of shear manufacturers that are on the market today. This article from C.E G. technical director Claudio Colombo offers a personal perspective on key factors to bear in mind when making that all-important decision.

The new TAURUS ARH 117 shear baler.

Factors to consider when purchasing a scrap shear

In the past, the process of buying a scrap shear was relatively uncomplicated because the market was populated by only a few well-known manufacturers who built their machines in their own factories. More recently, however, a large number of improvisers, subcontractors and pseudo designers have entered the market, adding an extra layer of complexity to the purchasing decision.

Not only does the purchaser need to decide on the size, performance and output of the shear but they also need to check the credentials of the manufacturer. Will the shear ordered from a certain company actually be manufactured by that company or will it be subcontracted to another manufacturer in another country? Does the chosen company even have a manufacturing facility and will it still be here tomorrow to offer spare parts, warranty and after-sales back-up?

A shear is an investment that, if maintained regularly, should give at least 10 years' trouble-free, continuous use. Choosing the right shear from a reputable manufacturer will avoid the purchaser paying exponentially more in maintenance costs as the machine gets older and will ensure that its productivity remains high.

Installation and running costs

When purchasing a shear, careful consideration must be given to overall running costs and especially to initial installation costs.

One-piece shears built on a single continuous self-supporting frame - like the TAURUS ACH or ARH series of shear balers - do not need expensive concrete foundations and therefore no special building permits. Installation and relocation costs are significantly reduced. Not only are shears with integrated frames quick and easy to install, but the frame provides extra protection for the hydraulic pipes.

Tougher and bulkier scrap

Processing scrap metal today requires recyclers to deliver a clean, foundry-ready product which must adhere to the strict supply regulations and conditions demanded by the foundry in order to: reduce toxic emissions during the melting phase; minimise slag build-up during new steel production; and lower overall production costs. For these reasons, collected scrap, light scrap and end-of-life vehicle scrap needs to be processed in a different way than in the past. A modern shear has the onerous job of processing scrap metal that, today, is tougher and bulkier than ever before.

In order to accommodate these new demands, the shears themselves have been forced to evolve in a number of ways. Modern shear balers are more efficient and more flexible than at any time in the past. Compression box lengths and cutting forces have increased while specialised computer programs have been adapted to process a wide variety of different scrap types.

A scrap shear should be chosen on the basis of its consistency, efficiency and flexibility.

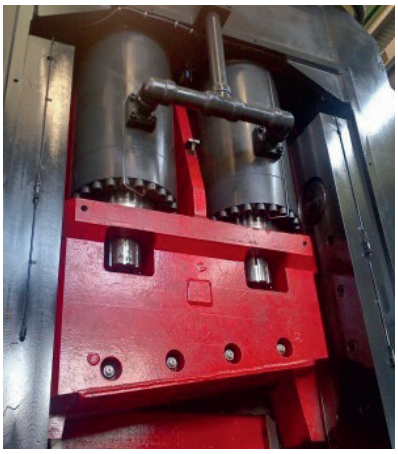
The way to assess the shear's capability in these areas is to split the machine into its three basic components: the shear itself; the pre-compression box; and the hydraulic and electrical components.

The shear essentials

When evaluating a shear's potential cutting performance, the important factors to consider are the shape of the shear head, the size of the surface guides, the cutting angle of the dynamic blade and the overall length of the blades. A low cutting ratio combined with insufficiently-sized guides results in high wear and tear on the guides and a shorter working life for the blades, as well as considerable stress on the blade carriage and on the overall structure of the shear.

Taurus shears use precision-machined, six-sided adjustable prismatic guides, which are ideal for keeping the head aligned and for even distribution of the cutting forces throughout the structure of the shear, thus reducing vibration and structural stress. The guides should be sized to minimise the specific load on the shear head so as to extend

TAURUS SHEAR WITH TWIN CUTTING CYLINDERS



Shears with a twin-cylinder construction create a more balanced and even cutting force which reduces friction on the side walls and guides, ensuring a longer working life with less downtime.
Compared with single-cylinder systems, piston guide ratios are improved, which means less wear on the shear guides and extended periods between servicing.
Last but not least, it is easier to dismantle and repair two small cylinders than one large one.

the working life of both the blades and guides, which in turn prolongs maintenance intervals and therefore reduces maintenance costs.

The TAURUS guides are manufactured from tempered steel and lined with a thick, synthetic polymer sheet. The combination of polymer on tempered steel greatly reduces wear and tear on the shear head guides; furthermore, the small metallic particles and filings which inevitably find their way between the shear head and guides become embedded in the polymer lining, preventing them from damaging the shear head linings.

By using the latest generation of composite materials and guides with steel-on-steel couplings, bronze on steel liners is now a thing of the past.

The synthetic guides are self-lubricating and are unaffected by a temporary absence of lubricants. Manufacturers who opt for other solutions must ensure that their liners are constantly lubricated and must carry out regular checks to ensure they are free from particles and filings. Failure to do so will result in excessive wear and tear of the liners.

Crucial cutting angle

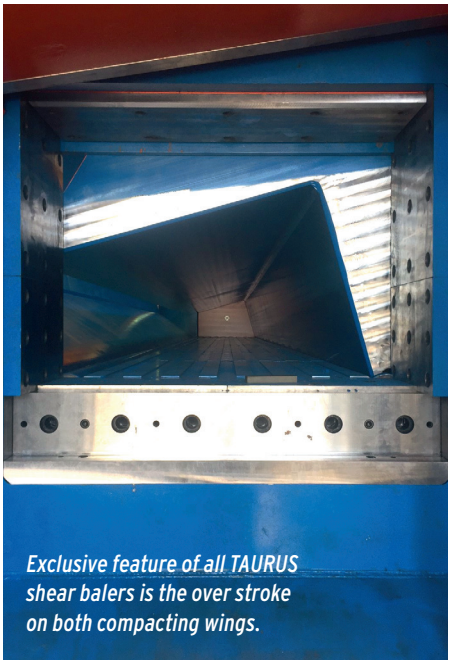
The mobile blades' cutting angle is of paramount importance: if the angle is not high enough, cutting capacity is inefficient; but if the angle is too high, there is the risk of causing overload stresses on the blade head and guides. Most accredited manufacturers have opted for a cutting angle of between 7° and 10°. Only a few manufacturers have chosen cutting angles of 12° or more.

By using an upward sloping mobile blade, material will be forced automatically in the direction of the upward slope, the angle of which will determine the lateral forces and eccentric loads created. These loads bare down directly on the mobile blade carriage and on the lateral guides of the shear head. Research shows that mobile blade angles above 10° offer a small increase in cutting capacity but disproportionately increase eccentric loads on the shear guides. Manufacturers who opt for cutting angles in excess of 10° will need to reinforce their shear guides and must accept higher levels of wear and tear.

The majority of manufactures have chosen angles of 7° to 10° in an attempt to find the best trade-off between ultimate cutting capacity, wear and tear and overload stress. Taurus has constructed its machines with cutting angles of either 9° or 10° depending on the cutting force of the shear. In our experience, this has proved to be the best compromise between cutting efficiency, guide wear and stresses placed on the mobile blade carriage and shear structure.

Blade seat

A vital factor is the design of the blade seat and what materials are used to manufacture it. Use of low-quality materials and/or an inappropriate design of the mobile and fixed blade carriages can lead after time to deformation of the under-blade support bed. A damaged or deformed blade housing area can make it impossible to maintain the correct clearance between the fixed and mobile blades, thus damaging the blades.



Exclusive feature of all TAURUS shear balers is the over stroke on both compacting wings.

Precisely to avoid this, TAURUS' blade seats are generously proportioned and incorporate over-dimensioned plates made from highly-elastic steel which can handle a wide variety of cutting forces with ease. TAURUS also uses interchangeable bushes in the blade screw seats to further reduce maintenance costs.

Feed box

The current trend is for an increase in the ultimate shear force: whereas 500 or 600 tons was previously considered adequate, many customers are now requesting shears with 800-1200 tons of cutting force to increase the variety of scrap which can be processed.

The current preference is also for two-wing systems, which are hinged longitudinally to the compression box. If choosing a two-wing system, those with an over-stroke function on both wings will compact the scrap more densely and create less wear in the compression box.

Shears of dual-wing design have a lower loading height than side-compression systems, and they are equally wide on both sides which gives them the flexibility to be loaded from either side. The lower height also means that the rehandling machine driver can visually check that the material is evenly distributed along the compression box floor and operate the functions of the shear remotely, thus avoiding the need for an additional operator in the shear's control cabin.

The thickness of the hardened, wear-resistant steel inside the compression box must be no less than 30 mm. If particularly heavy scrap is processed regularly, then TAURUS shears can be equipped with a 50 mm Hardox liner.

PRODUCT HIGHLIGHTS

Company C.E G.
C.E G. designs and manufactures equipment and solutions for the metal scrap industry. Current product line, comprehensive of shears, balers, shredders and pre-shredders.
High technology, versatility and ease of use are the characteristics of the TAURUS – Bluline, TAURUS – Redline and Sascoline productlines.
Special processes and features have been designed and incorporated to facilitate the ease of use, management, installation and maintenance of all C. E G. machines.

The compression box design, maximum load capacity and compression force of the wings must be suitable for the shear's rated cutting force. It is pointless having a 1000-ton cutting force if the pre-compression box is unable to compress the scrap to a density which requires 1000 tons of shear force.

Unless required for a specific reason, the compression box should not be less than six metres long. A shorter box limits the types of material that can be processed and reduces the shear's resale and trade-in value.

TAURUS pre-compression box worked on an NC milling centre.

Hydraulic system

Use of constant-power piston pumps is essential - nothing else will do. And beware of combining piston pumps with low-pressure pumps, especially when the ratio between the piston pump flow rate and the total flow rate is low.

Low-pressure pumps serve only to provide a rapid approach, after which just the piston pumps take over, with a drastic drop in the work speed which is more noticeable the lower the ratio between the piston pumps flow rate and the total flow rate. Shears using low-pressure pumps seem quick when running with little or no material in the feed box, but they become much slower when normal loads are processed. A customer will end up with a machine that does not have the performance initially stated.

When compared to systems with similar hydraulic flow rates, low-pressure pumps only keep down the cost of the hydraulic system.

Apart from choosing the correct pumps, special attention must be paid to the filtering system, especially: air filters on the tank; filtering under pressure on the driver circuit; filtering on the return line; and independent filtering circuits.

Electronics

The electronic and software systems in modern shears are vitally important. New software, automated scrap processing programs, lasers and internal cameras all play their part in increasing the efficiency of the shearing process, while also reducing maintenance costs and downtime.

The cause of so many machine stoppages, the mechanical limit switches commonly found on older designs can now, thankfully, be avoided. Modern electronics coupled with precise lasers allow both the shear and clamp strokes to be controlled individually and in synchronisation with each other.

Millimetre-precise monitoring and positioning of the compression wings is now possible thanks to linear and/or rotary encoders. This precise monitoring coupled with new software programs allows for a greater variety of scrap to be processed more efficiently. Furthermore, the hydraulic pressure within the wing cylinders can be reduced before the end of the stroke, which lowers impact shock and vibration.

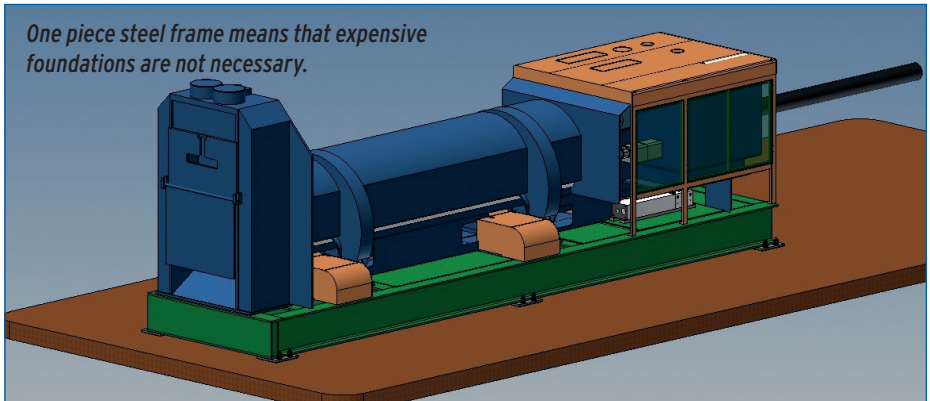
As with the wing cylinders, the stroke of the central ram can also be accurately controlled with the help of a positioning laser and proximity switches embedded within the hydraulic cylinder.

Transducers to control the pressures and temperature-sensitive block filters are now more commonly used instead of old-style mechanical pressure switches.

Depending on the type of scrap being processed, the operator panel can be used to individually set different working parameters or to choose from a variety of fully-automated programs. The operator panel is also useful for monitoring the different functions of the shear during operation.

Only with experience and years of trial, error and refinement is it possible to successfully consolidate an operating program that optimises all the different functions available and so creates the ideal work cycle for any given material.

TAURUS has done the legwork and, after many years of experimentation and refinement, we have developed programs that optimise the different shear functions to create the perfect working cycle for each individual scrap type. Such programs are our closely-guarded secret but the benefits can be enjoyed by all TAURUS shear owners.



One piece steel frame means that expensive foundations are not necessary.

In summary

When seeking a new scrap shear, the purchaser should look for a machine that is fully up-to-date with the latest technologies so that it does not become obsolete shortly after purchase. It must be built using quality components and in such a way that it will provide many years of reliable service.

Consider what you want to achieve with the shear and where you want to place it - not just now but also in five, 10 or 15 years' time. Also, consider the maintenance costs over time and avoid purchasing a shear where these start to exceed depreciation costs.

By taking additional time in choosing the correct shear, and even if the machine is a little more expensive initially, your investment will pay dividends over time.

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