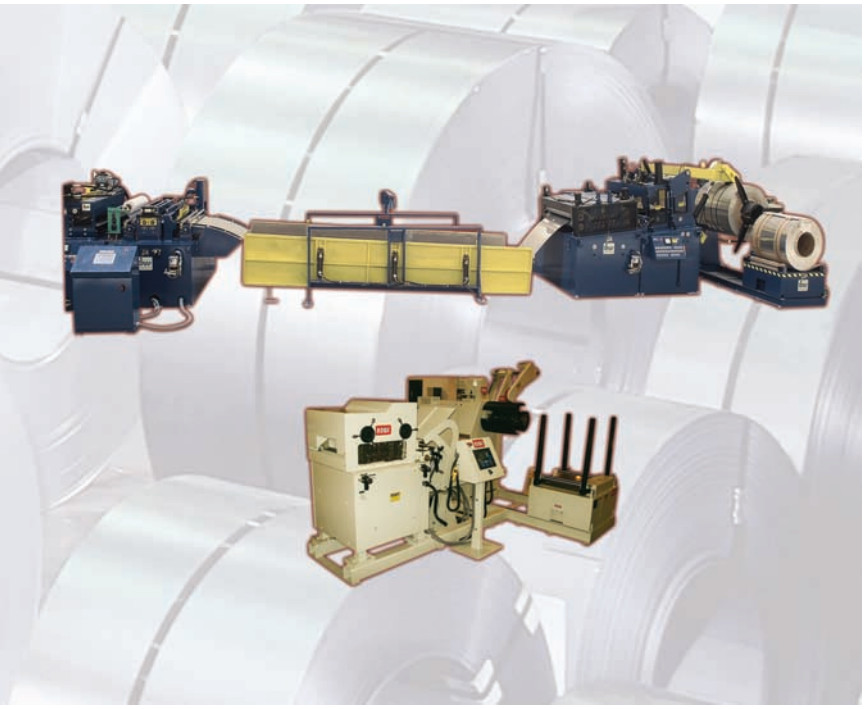
ISMR Says: The key to designing a compact system is in the seamless integration of system components. All system components – from payoff to press – have to work together to deliver maximum productivity in a minimum of space.

Compact Coil Systems

Limited amounts of floor space in factories, coupled with requirements to maximize the potential of the floor space available, have led to increased demand for compact coil lines and space saving systems.



Compact coil lines or space saver systems have been very popular in Europe for many years. These systems are driven by the demand for shorter changeover times, limited production runs and the requirement to add additional production to existing plant layouts while conserving valuable floor space.

ISMR looked at a variety of space-saving solutions from US coil press feeding specialist, Formtek Maine, which has over 50 years of experience and innovation in the field.

Production philosophy

"The concept of compact, space saver systems," said Matt Watson, sales and marketing manager of Formtek Maine, "is to design and engineer lines within a small footprint that are still big on features, flexibility and functionality.

"Our ability to maintain 98% of our product production within our facility allows us full control over our shop throughput," he continued. "Our

Above: **Formtek Maine's 7,897 m² manufacturing facility in Clinton, Maine (USA)**

7,897m² facility is designed to allow product to flow from raw material at the fabrication end of the building to finished product shipping to our customers from the assembly end of the building."

In the centre of its building, product flows through a machine shop which features multiple horizontal turning centres (two of them with automatic bars feed capability), one with dual turret and turning capacity of 482mm diameter (3988mm between centres) and 2934 kgs of loading capacity, multiple CNC machining centres and a CNC bridge mill with travel capacity of 1752.60mm x 3200.40mm x1346.20mm.

The facility also has roll hardening and grinding capabilities. Programming for the machine shop is done with Surf cam software.

"Our manufacturing department is staffed with 71 highly trained employees," said Watson. "We have an engineering staff of seven people which allows us to quickly process customer orders as well as provide custom coil processing application solutions. Our sales staff consists of 10 people available to rapidly respond to customer applications. Our service department is staffed with eight people (four located in Clinton, ME, one in Chicago, IL, one in Piqua, OH, one in Dallas, TX and one in Friobourg, Switzerland). This allows us to provide quick response to our customers, no matter where they are located. We also use a true 24/7 service programme which allows our customers direct contact with a factory technician anytime it may be required."

The Compact Coil Line principle

The Compact Coil Line principle revolves around combining the three functions of coil payout, flattening and feeding of the material. This is typically

achieved using several configurations; a straightener/feeder unit with a motorized uncoiler; a straightener/feeder unit along with a powered coil cradle or a servo feed/pull through straightener and motorized uncoiler.

Inherent in a successful compact system approach is an understanding of what the application requires. Critical factors which need to be addressed are:

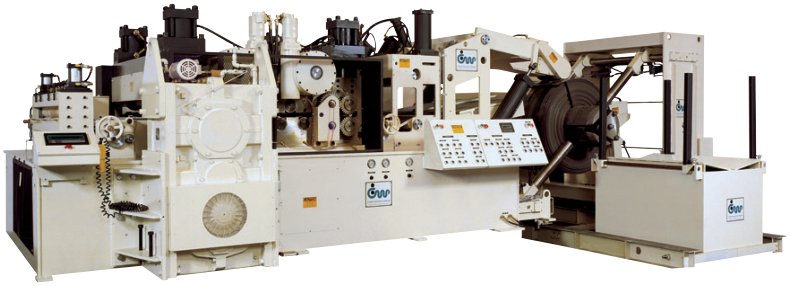
- **Will the system be running piloted tools?**
- **Are there any surface critical material applications?**
- **What are the minimum and maximum feed lengths?**
- **Are there a lot of partial coil operations?**
- **Does system require top and bottom payoff capability?**
- **What level of automation is desired?**

All these application requirements need to be considered for the equipment supplier to manufacture a compact system that will satisfy the end user and will, more importantly, allow them to process the jobs for which they purchased the equipment originally.

The following are examples of compact systems based on special requirements - all with the common desire to save floor space.

Thick high strength steel (HSS) application:

The critical objective in the design and manufacture of this space-saving system is to provide ultimate versatility in a limited floor space.



Above: **1524mm x 6.35mm (762mm x 12.7mm) x 18142kgs space saving system.**

The press feed system has the capacity to handle materials from 1.22mm through to 6.35 mm thickness up to 1524mm wide, with the ability to process 12.7mm thick material up to a width of 762mm. A key consideration was the wide variety of coils with yield strengths ranging from a low of 413n/m^2 to a high of 827n/m^2, which the system would have to process.

Flat material, free from scratches or markings, needed to be fed into a compound dye to manufacture their parts. The solution offered by Formtek Maine, for this application, was a Compact CWP Space Saving Coil Line.

To eliminate the potential of material wraps sliding on each other, a synchronized dual axis control platform was used. During the acceleration portion of the feed progression, the uncoiler is powered as a follower to the straightener/feeder.

As the straightener/feeder unit starts to decelerate into position, the second axis follower transforms into a constant tension back drive. To efficiently process the wide variety of materials, at the tensions required for those materials, the material thickness and width is programmed into the control. This allows the uncoiling to be synchronized to the feeding. A sensor determines the O.D. of the coil. Using this data along with the position information from the straightener/feeder controller, the coil mass, acceleration required and ideal back tension during deceleration are automatically calculated and implemented for a smooth efficient operation.

Conversion from plain steel to high strength steel (HSS)

Some companies are striving to lower material part weight without reducing the load carrying capacity of the parts. For some companies, as Watson points out, "The dilemma is that their existing coil handling equipment cannot safely handle HSS materials and they may not have the room to put in a conventional coil line."

To minimize the system footprint and meet coil requirements, this system is designed so that the coil reel is loaded from the back of the line.

Progressive die application

For progressive die applications, systems may require the ability to payoff the top and the bottom of the coil, the ability to process material with progressive dies and thread-up assistance with an automated control platform.

This compact coil system with a motorized reel features a dual operation mode to allow the coils to payoff the top or the bottom. The coil car is supplied with power thread-up assist rolls to be used when threading up material which will pay off the bottom. This feature allows the lead edge of the strip to be

forced straight up into the guide chute on the entry end of the straightener/feeder for hands-free thread-up. The straightener/feeder unit is also supplied with pneumatic roll release to allow the upper feed and

straightening rolls to open and allow the pilots to register the material into position.

All of these features combine to provide a compact press feed system which is easy to thread-up and operate. According to Watson, "This type of coil line expands the range of products that manufacturers with diverse customer bases are able to provide."

Compact space for Cut-to-Length

The CTL system shown was designed not only as a compact system but also accommodates an overhead crane capable of picking up the coils just 889mm from the ground, which would allow for easier coil loading capabilities. The system is also designed to interface with remote download communication requirements.

The system, with a capacity of 1016 mm x 11.10 mm x 13,608 kgs and a material yield of 413n/m², is built with a coil cradle entry section designed to payoff the bottom of the coil as opposed to units

Right **Compact Coil System allows for back load of coils directly into the cradle section.**

Left: **CWP Compact Coil System can payoff the top or bottom of the coil.**

which pay off material from the top through an overhead loop chute arrangement. This design allows for a back load of the coils directly into the cradle section of the system. A heavy duty hydraulic debender unit accepts the lead edge of the coil and breaks it for easy thread-up into the straightener/feeder unit.

The straightener/feeder unit is set up with ethernet communication to allow the system to accept a remote feed length download. Upon receipt of the feed length, the system powers up and processes the desired length. Once the hydraulic bow tie shear strokes to cut the part off it feeds onto a part staging table and waits to be picked up by a remote controlled staging car. The remote control car takes the blank and delivers it to the next manufacturing station.

Partial coil operation

Right: **609 mm x 6.35 mm x 4,530 kgs Compact Coil System with touch screen interface**

Bottom: **Compact Coil System with payoff from bottom of coil.**

For short run, partial coil operations, Formtek has designed a compact system to handle 609 mm x 6.35 mm x 4,535.90kgs. The CWP system features a motorized uncoiler with photo eye loop control to allow the slack material to develop directly below the uncoiler spindle. Both primary and secondary hold-down arms are provided with powered rider rolls for thread-up and to allow for rewinding the slack material during partial coil operation.

A touch screen interface allows for all of the system programming, thread-up manual, maintenance manual and complete system diagnostics.

Blanking system

This complete feed system to blank material 228.6mm wide x 6.35mm thick fits within 4 metres of floor space.

A 304mm straightener/feeder unit with 69.85mm diameter rolls was supplied to process the required feed lengths. A complete threader/peeler system with hold-down arm, powered rider roll, breaker bar, peeler table and peeler blade allow for thread-up of the system. The stock reel features manual expansion and photo eyes to control the slack material under the spindle of the uncoiler.

The most economical compact system, says Formtek, is the servo feed with pull through straightener and motorized uncoiler configuration. This system allows slack material to be gathered directly under the uncoiler spindle with the use of a loop control device. The pull through straightener is adjusted based on the material thickness to remove the coil set prior to the material reaching the servo roll feed. The servo feed unit is programmed for the required feed length and speed settings for the job being processed.

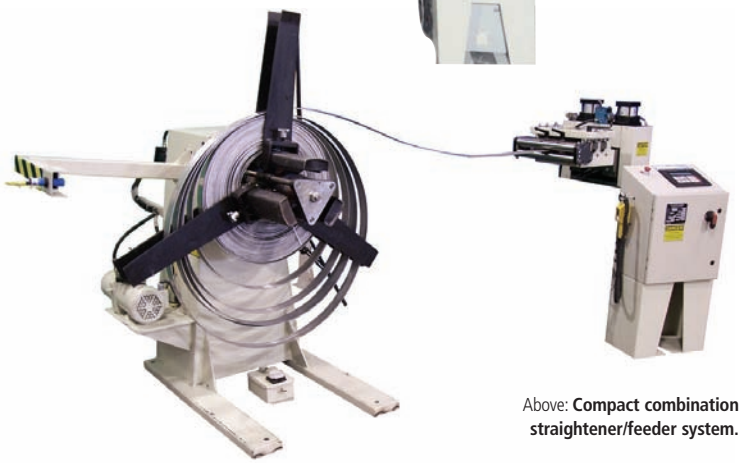
This type of compact system does not allow the straightener rolls to be opened during operation so it is designed for applications which do not require pilot release to register the material into position.

Coilmate/Dickerman, a division of Formtek Maine, was asked to provide robust and affordable compact systems for a variety of coil processing applications. This system was designed for a straight blanking application without any pilot registration and fits within 4 metres of floor space. Components include a 2,721.60 kg motorized uncoiler with a proximity loop control along with a SMX18 and a SM-5 pull through straightener to meet a customer's application requirements and budget constraints.

CWP is also supplying SMXSE12 CSF combination straightener/feeder units with pilot release head design, handwheel adjustable edge guides, peeler table, peeler blade, matt chrome feed rolls and a transformer for 480 volt operation. A 4RM-18 motorized stock reel is being supplied with 3628 kgs coil capacity, 330 mm – 533 mm expansion range, hold-down arm, powered rider roll, 1828 mm O.D. capacity and paddle loop control.

This type of system is suitable for processing tight-tolerance, deep drawn metal stampings used for a variety of products including automotive, door lock hardware, plumbing, communication and fire protection.

"The key to designing a compact system," concludes Matt Watson, "is in the seamless integration of system components. It's just not as simple as adding a straightener/feeder unit. All system components - from payoff to press - have to work together to deliver maximum productivity in a minimum of space." END



Above: **Compact combination straightener/feeder system.**

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