A roadmap for AI in the tire industry

VMI president & CEO Harm Voortman explores the step-changes that lie ahead for the tire manufacturing industry

Harm Voortman, president & CEO, VMI

Artificial Intelligence (AI) marks a big inflection point for the tire industry: quite different from the control & automation systems we have today, it could just change nearly everything.

If the industry could start again from square one, we would probably do things very differently: less reliance on sheer scale and mass production, more focus on shorter runs, more 'build on-demand'.

But that kind of revolution is not affordable or possible right now. We have to optimise, evolve and develop the facilities we have. That means more automation, more AI.

Today, automated tire building machines (TBMs) ensure consistency of production, excellent quality without intervention by a skilled operator, addressing the tire industry's key concerns: productivity, quality, consistency and operational efficiency. But this is no longer enough.

We all know how fast the industry is changing – and why. SKU numbers are rising fast, so production runs will be smaller, yet margins must be protected. Human skills are in short supply, costs are going up, while environmental concerns mean we need to focus on advanced materials, higher performance, lower energy-use and greater responsiveness.

The tire industry can't deal with all these issues by doing the old things in new ways. We need to work much smarter than before.

AI to the rescue

AI in manufacturing is based on real-time data flows through sensors, analysis of massive data sets, pattern recognition, autonomous decision-making and machine

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learning (ML) for continuous optimisation.

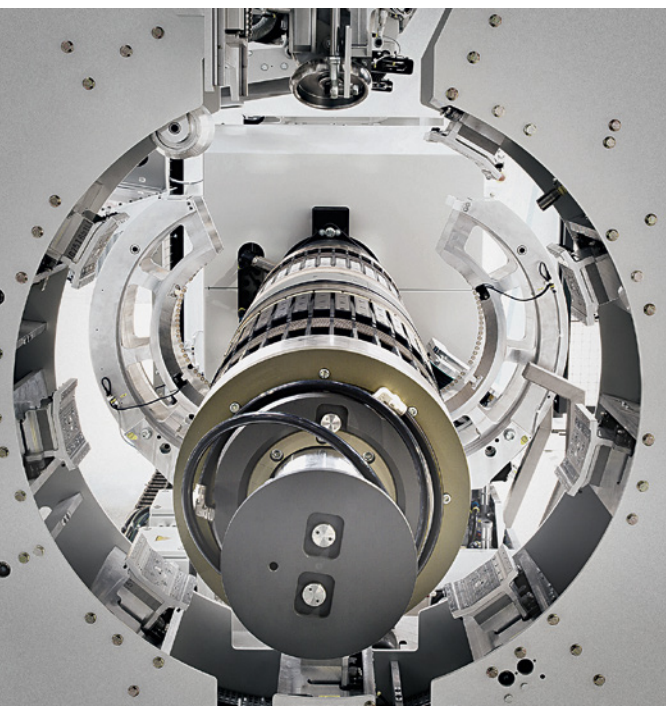
AI of this kind is used in many sectors already: diagnostics for healthcare, fault-detection in different industries, from power-generation to complex machines, and in managing logistics, storage and supply-chains.

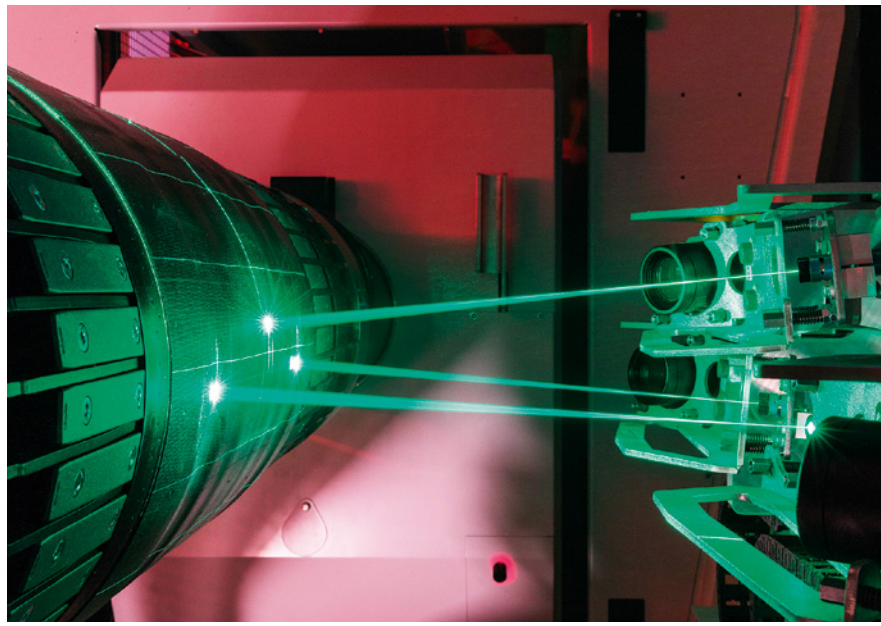
In tire building, AI potentially has a big role to play in everything from cost- and energy-reduction to elimination of both waste and scrap, while enabling more agility, better sustainability and higher quality.

We need to unlock the potential of AI urgently, because the business model of our industry is changing fast. Tire building today is a mass production industry. Costs and ROI depend on volume: the more tires you make without major interruptions, the more profitable your company.

Yet the rise in SKU numbers, together with the need to use more advanced materials – to reduce tire weight, cut particle emissions and lower fuel costs – means we must move, step-by-step, to a different business model. This should be based on much smaller production runs, making 10 or 50 of each variant, rather than thousands at a time.

The industry cannot afford a revolutionary change, such as moving directly to single-cell manufacture on greenfield sites.





We need evolutionary change, instead: moving in a logical, rational way towards a much more flexible production model, monetising each new development and pursuing a clear strategy for the future.

For VMI, that process has already started, with initial applications of AI, which are designed to offer measurable benefits now, while building foundations for more radical changes.

Fault Detection and Elimination: Uses AI with our installed vision systems to identify foreign bodies, then automatically stops the process so they can be removed. As the alternative is to make a tire that will be scrapped when the fault is eventually discovered, this saves money, material and time, while raising quality.

Process Optimisation: Matches positioning of breakers on the drum to ensure optimal use of material, perfect splices and consistent highest quality at all times. Again, once this solution has been fully refined, it will move beyond the capabilities of even the most skilled operators, enabling us to raise quality, save materials, cut waste and deliver consistently excellent product quality.

It's not just about AI, either. We are looking at ways to drive change for the better by using smart software *only*, without the need for engineering work and capital investment. That's the point of:

Smart Run Empty: This matches input materials to the planned production run. Material input stops when the TBM has enough to finish the run, so nothing is left in the machine to be discarded as waste. That saves money, energy and emissions, while making the process less dependent on the skills and experience of the operators.

These first applications represent an inflection point in use of smart software with pre-existing systems and components. Whether we use true AI or advanced algorithms there is one common factor: the ability to enhance performance without the need for physical engineering. This accelerates change and delivers performance gains faster and with less disruption than in the past.

We simply take the TBM as it is today and use software, data analytics and autonomous decision-making to add value to current investments.

These are classic examples of the practical, step-by-step changes the industry needs, making current processes more flexible and capable of evolution. And it is just the beginning.

AI-based technologies will be transformational in their long-term impact. Yet our task is to deliver the benefits here & now, as the market goes through radical changes.

These changes need leadership in everything from market understanding to the interaction of many different technology disciplines. This is the start of a journey to a very different type of future.