

# Tyre mould production: increasing productivity through automated part setting



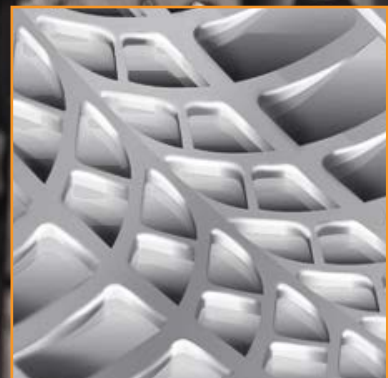
**Eliminate manual intervention**



**Increase productivity**



**Save time**



# Overview

By 2022 the global tyre market is estimated to exceed 2.5 billion units. This is driven, in part, by a strong focus on fuel efficiency, environmental regulations and the current consumer trend towards eco-friendly tyres. In this expanding market it is imperative that high-volume tyre manufacturers maximise machine productivity to meet the growing demand, as well as increase profits.

To support these aims, manufacturers of tyre moulds must strive to reduce scrap, save time and maximise productivity. Their challenge is in the machining of each mould segment. There can be as many as 12 different pitched segments in one complete mould circle. Machining accuracy is therefore critical in order to achieve a seamless, fully aligned and repeatable tread pattern from one segment to the next.

## Process

Precision machining of cast tyre tread mould segments on 5-axis machining centres.

Mould segments were positioned and key features located manually prior to machining.

Once positioned, the top, bottom and pitched faces were milled, followed by drilling and tapping operations.

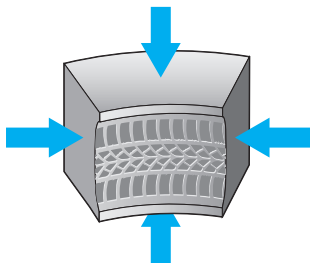
## Challenge

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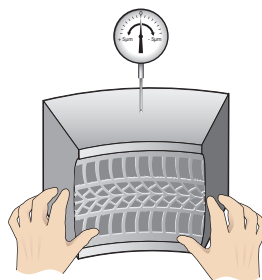
**Reduce scrap, save time and maximise productivity**

The cast tread segment arrived at the machining stage with four 'unknown' faces. Operators then loaded the part into a 5-axis machining centre, before manually locating the faces and other key features. This was often a time consuming and error-prone procedure, which required a high level of operator skill. Once set, the part was machined. The existing manual process resulted in a production time of 30 minutes per segment. Any errors introduced during set-up resulted in tread pattern misalignment and/or unacceptable segment separation.

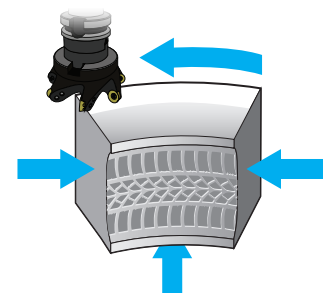
1. Cast segment with four 'unknown' faces



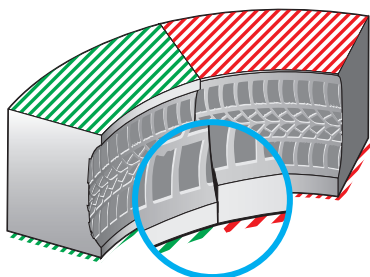
2. Manual part set-up on 5-axis VMC



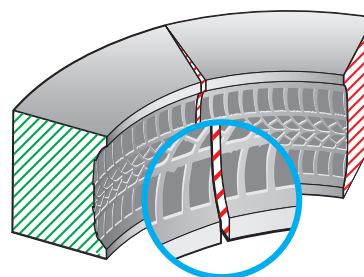
3. Four faces machined using face mill



4.a Tread pattern misalignment due to incorrect set-up of top and bottom faces



4.b Unacceptable segment separation due to incorrect set-up of pitched faces



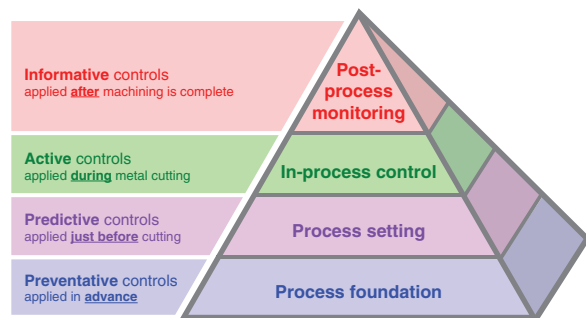
# Process considerations

Renishaw engineers have considered key elements within a customer's process and production stages of manufacturing using Renishaw's **Productive Process Pyramid™**.

This framework is used to identify and control the variations that can occur at key stages of the machining process.

For more information, please visit the When do I probe? section of the Renishaw website:

[www.renishaw.com/en/whendoiprobe](http://www.renishaw.com/en/whendoiprobe)



Productive Process Pyramid

## Solutions

### Manufacturing process focus: process setting

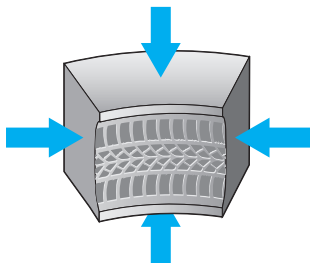
Focusing on **process setting**, Renishaw engineers have introduced measures to maximise machine productivity and improve product quality.

The introduction of the Renishaw OMP400 high-accuracy inspection probe has enabled rapid, automated on-machine part set-up, eliminating the need for manual intervention. Machine productivity has increased due to a 50% reduction in the time taken to produce one segment, and the operator time previously spent setting the part has now been released and utilised elsewhere.

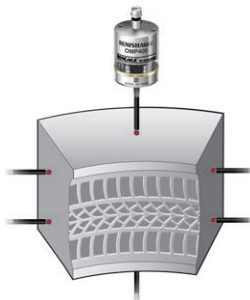


Automated part set-up using the OMP400

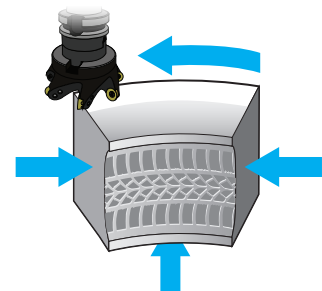
1. Cast segment with four 'unknown' faces



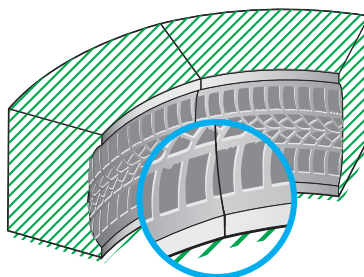
2. Automated part set-up on 5-axis VMC



3. Four faces machined using face mill



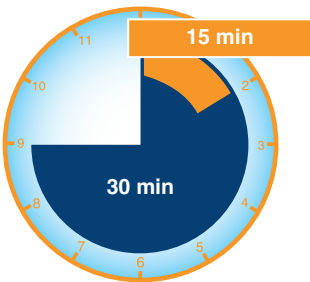
4.a Tread aligned and segment separation within tolerance due to the rapid, accurate and automated part set-up



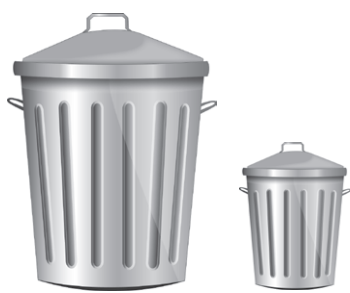
## Results

These charts provide a typical illustration for this industry application where probing has been introduced.

### Improved production efficiency

	Without probing	With probing	Benefit	
	Time/part	30 min	15 min	50% reduction
	Parts produced/year	1825	3650	100% increase in throughput

### Reduced scrap

	Without probing	With probing	Benefit	
	Scrap rate	60%	5%	91.7% reduction
	Scrap parts/year	1095	183	912 part reduction

### Increased savings

	Without probing	With probing	Benefit	
	Scrap parts/year	1095	183	912 part reduction
	Cost/part US\$	75	75	
	Total cost/year US\$	82,125	13,725	68,400 saving

## Summary

With the Renishaw OMP400 high-accuracy inspection probe now installed, the company has halved the time it takes to produce a tread segment and increased throughput by 100% using its existing assets. With scrap reduced by 91.7%, the company has been able to save US\$68,400 in the first year.

**Additionally, the new capability has allowed the company to:**

- Enhance machining capability and take on more work
- Increase automation and reduce human intervention
- Reduce delivery times and improve customer relations

## Contact

To find out how you could benefit from our process control solutions, contact us today – find your local office at [www.renishaw.com/contacts](http://www.renishaw.com/contacts)

## Customer comment



Our company was incurring significant financial losses due to high rejections rates and excessive production times. This prompted the management team to investigate the process control solutions offered by Renishaw. After installing the OMP400 high-accuracy inspection probe, huge savings in costs and time have become a reality.



## Best practice

Productive Process Patterns™ from Renishaw provide guidance on best practice and the implementation of a wide range of probing solutions.

For more information regarding job set-up and other applications, visit [www.renishaw.com/processcontrol](http://www.renishaw.com/processcontrol)



## About Renishaw

Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

### Products include:

- Additive manufacturing and vacuum casting technologies for design, prototyping, and production applications
- Dental CAD/CAM scanning systems and supply of dental structures
- Encoder systems for high-accuracy linear, angle and rotary position feedback
- Fixturing for CMMs (co-ordinate measuring machines) and gauging systems
- Gauging systems for comparative measurement of machined parts
- High-speed laser measurement and surveying systems for use in extreme environments
- Laser and ballbar systems for performance measurement and calibration of machines
- Medical devices for neurosurgical applications
- Probe systems and software for job set-up, tool setting and inspection on CNC machine tools
- Raman spectroscopy systems for non-destructive material analysis
- Sensor systems and software for measurement on CMMs
- Styli for CMM and machine tool probe applications

For worldwide contact details, visit [www.renishaw.com/contact](http://www.renishaw.com/contact)



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