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Investor Day

CMM Product Division

15th May 2014

Presented by Dave Wallace

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Customer needs

Coordinate Measuring Machines (CMMs)

- Are devices for measuring the physical geometry of engineering components.
- Are mostly automated by computer control and drives.
- Measurements are achieved by a probe attached to the last axis of the machine “telling” the computer when it touches the part
  - the invention of which (by Sir David McMurtry) lead to the founding of Renishaw.
- Accuracy is typically a few microns (= a few 0.001 mm) over the working volume of the system.

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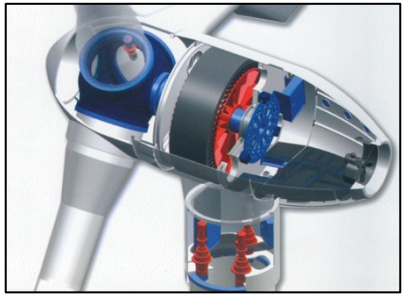
Customer needs – CMM key applications

- Aerospace: engines, landing gear, hydraulic valves etc.
  - Key drivers: fuel efficiency, safety, throughput due to increase in orders

- Automotive: engines, drive-train, body-in-white
  - Key drivers: product life expectancy, safety, throughput, fuel efficiency



- Power generation: housings, gears
  - Key drivers: product life, efficiency (accuracy), “going green”

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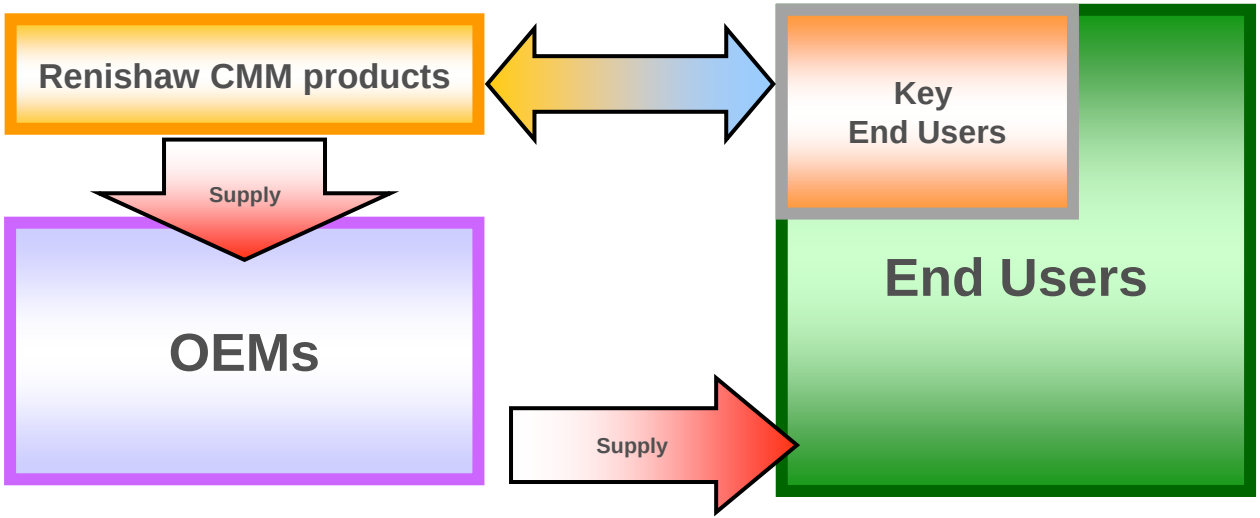
Customer needs

- Renishaw design and manufactures CMM products sold to:
  - OEMs that make CMMs
  - End users that use the CMMs
  - Third party distributors and retrofitters who sell the products on



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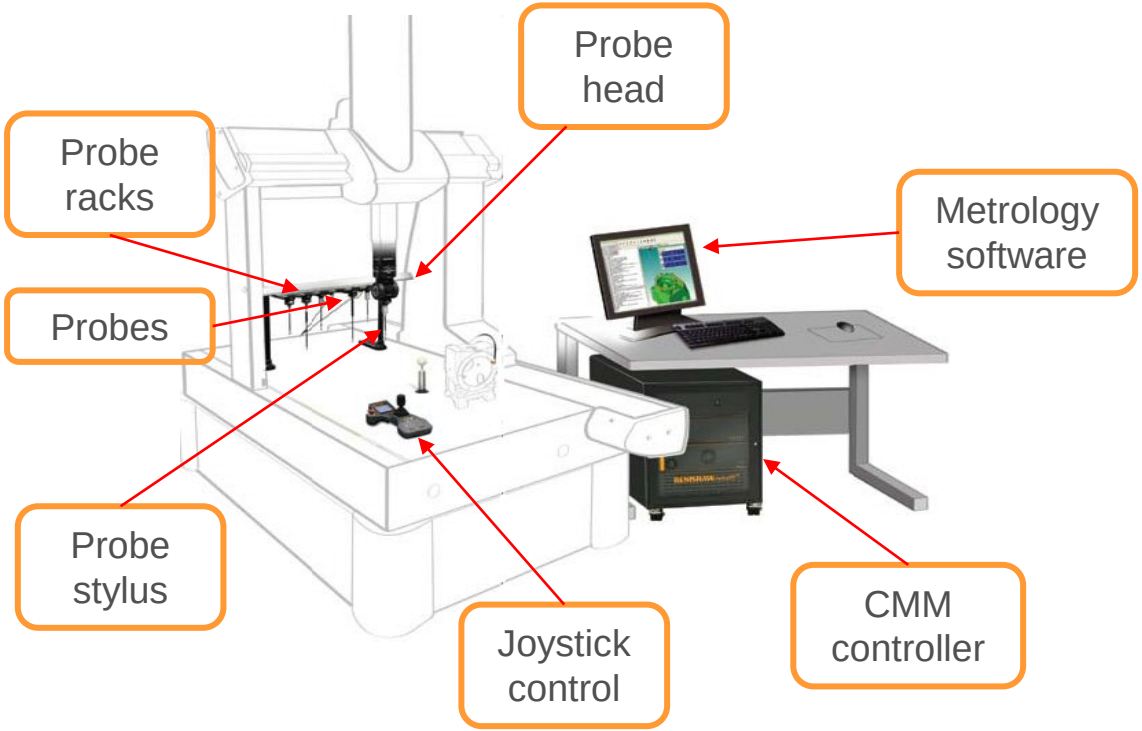
Engineering solutions

Renishaw's range of CMM products



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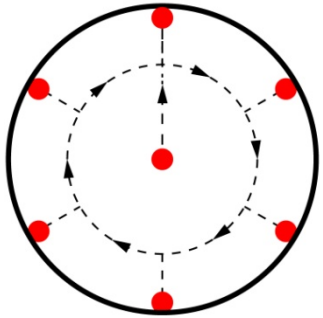
Engineering Solutions – probing

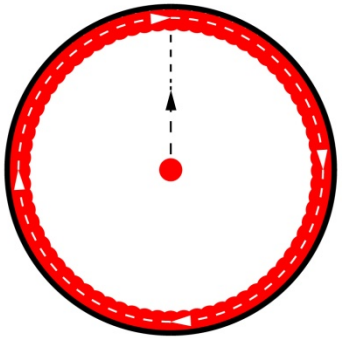
Touch-trigger probing systems

- Touch-trigger probes measure discrete points, making them ideal for inspection of 3-dimensional geometric parts where form is either assumed or not critical – they do not say *how much* they are deflected, but merely that they are deflected.



Scanning probing systems

- Scanning probes maintain contact with the part whilst moving to acquire several hundred surface points each second, enabling measurement of form as well as size and position – they say how much they are deflected hence allowing scanning.



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Engineering Solutions – motorised heads

- For 30+ years Renishaw's motorised probe heads PH9 and PH10 have increased throughput and utilisation of CMMs by adding CNC controlled repeatable probe re-orientation.

- In last 10 years Renishaw has responded to user demands for even greater throughput, higher data collection rates and more inspection capability with 5-axis probing systems thereby “letting the head do the work”....


DATA
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Watch me on YouTube

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Successful outcomes – throughput examples

- Manufacturer of machined castings for automotive industry worldwide: retrofit of 7 CMMs with 5-axis technology (PH20 and REVO), Renishaw controllers and Renishaw measurement software – new capabilities and throughput advantages

- US auto manufacturer with long standing relationship with a Renishaw competitor: throughput is key (seconds count)
  - Cell 1: competitor product 40 mins; REVO 26 mins
  - Cell 2: competitor product 50 mins; REVO 23 mins 39 secs

  The customer is very happy!

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Successful outcomes – throughput examples

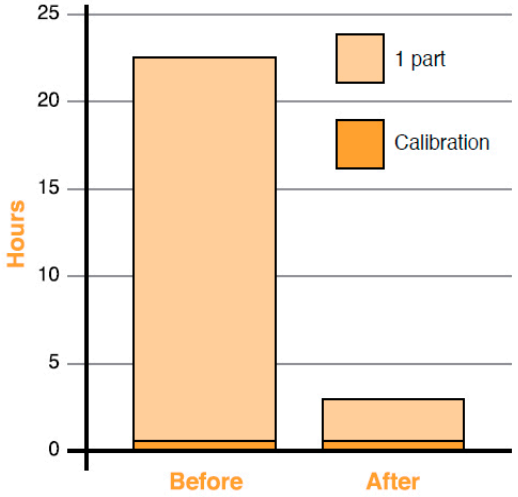
Aerospace: Engine blisk

922% improvement in throughput

Measurements
9 sectional scans, 8 longitudal scans
2 root profile scans per blade, 1 scan of annulus profile

Before
3-axis scanning at 10 mm/sec
Measurement time for 1 blade = 46 m
Measurement for all blades = 22 h 11 m

After
REVO® at 200 mm/sec and 50 mm/sec
Measurement time for 1 blade = 4 m 30 s
Measurement for all blades = 2 hours 10 m



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Successful outcomes – throughput examples

Automotive: Cylinder head

690% improvement in throughput

Measurements
12 valve seats
12 valve guides

Before
3-axis scanning at 15 mm/sec
Measurement time = 29 m 13 s

After
REVO at 400 mm/sec and 50 mm/sec
Measurement time = 3 m 42 s