Production Of Connection Rods In Power Generation

Industry : Power Generation

Component : Connection Rod

Annual Production: 2,000,000

Component Material : Aliminium

Process Overview

The crankshaft and pin bores are finish machined using Rigibore's Zenith Solution

An ABB Robot 1RB 6640 unloads the con rods from the Stama 536 machine and places parts into a Intra gauge where critical bore sizes are measured.

This value is relayed to the machine's Fanuc control through the PLC. The running CNC program picks up a requirement to adjust the tool in the carousel, with no spindle downtime.

Return On Investment (ROI)

Improved Performance

Before Zenith	
Scrap Volume	988
Operator Skill Level Required	High
C_{pk} Performance	1.17

After Zenith	
Scrap Volume	642
Operator Skill Level Required	Low
C_{pk} Performance	1.97

Rigibore macros set an upper and lower warning limit on bore sizes, automatically adjusting to stay within a narrow tolerance band and significantly improve C_{pk}.

Reduced Cycle Time

Before Zenith	
In Process Checks (Per Component)	22
Machine Downtime (Per Component)	12 mins 33 Secs
Total Component Cycle Time	48 mins 20 Secs

After Zenith	
In Process Checks (Per Component)	0
Machine Downtime (Per Component)	1 min 12 Secs
Total Component Cycle Time	23 mins 17 Secs

Automatic cutting edge adjustments are made whilst the tool is idle in the machine carousel, this maximising spindle utilisation and reducing downtime.

Production Of Jet Engine In Aerospace Industry

Industry : Aerospace

Component : Jet Engine

Annual Production: 20,000

Component Material : Nitronic Stainless Steel

Process Overview

The Zenith solution was automatically programmed to back off its preset size so that it first 0.1mm depth of cut allowed a **remaining 0.1mm depth of material left for the final pass**.

A trail cut was performed and measured using a spindle probe, this data was transferred to the CNC machine, allowing Rigibore macros to calculate the compensation to take the hole to the finished size.

The macros then initiate an automatic adjustment to the tools cutting edge, compensating to nominal diameter for the finish cut.

Return On Investment (ROI)

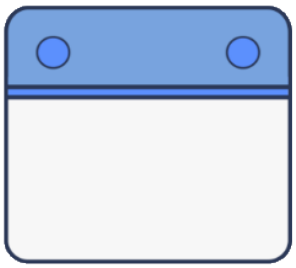
Eliminate Scrap

Before Zenith	
Yield - Good Parts	19,746
Scrap Rate	1.27%

After Zenith	
Yield - Good Parts	19,920
Scrap Rate	0.40%

Automation provides a consistent and repeatable process, removing the risk of human error associated with manual adjustments.

Increased Savings



Annual Payback		
	Prior To Zenith	After Zenith
Cost Of Components	£22,000	£22,000
Scrap Parts/Annum	244	80
Total Savings / Annum		£3,608,000

Approximate Payback Period
18 Hours

Because of the nature of the project, with such a high-value component material, the initial cost of investment was paid back with one cycle.

Heavy Manufacturing Of Track Links

Industry : Heavy Plant

Component : Track Links

Annual Production: 1,500,000

Component Material : Cast Iron

Process Overview

The machine tracks the unique ID of the tool which machines each of the bores, a probe then measures the bush and pin bore diameters, pairing these values in the Siemens 840D control to correspond with the tool ID that produced the bores.

Using the probe data the program looks for two consecutive parts, machined by the same bar, outside of a **warning limit of ±0.020**. When this trend is seen the tool's cutting edge is automatically compensated back to nominal.

Return On Investment (ROI)

Overall Equipment Effectiveness (OEE)

Before Zenith	
Item	**Data**
Shift Lenght	8 Hours (480 mins)
Breaks	1 hour (Total)
Machine Down Time	47 mins
Parts Per Shift	1,120
Scrap Parts	80
Total OEE	**75.9%**

After Zenith	
Item	**Data**
Shift Lenght	8 Hours (480 mins)
Breaks	0
Machine Down Time	22 mins
Parts Per Shift	1,682
Scrap Parts	47
Total OEE	**92.9%**

Automation of bore sizes reduces machine downtime significantly, allowing adjustment to be made with the tool remaining in the machine carousel.

Whilst creating a faster, more efficient process, the Zenith solution also improves accuracy and reduces scrap parts per shift.

Production Of Hydraulic Pumps For Automotive Industry

Industry : Automotive

Component : Hydraulic Pump

Annual Production: 1,700,000

Component Material : Cast Iron

Process Overview

Firstly, a baluff chip was used to track which unique tool ID machined each of the bores. Next a Renishaw Touch Probe measured the bore diameter, storing values in the Siemens 840D control to correspond with the tool ID that produced the bore.

Rigibore macros ran on the control, carrying out trend analysis on data from the probe, comparing bore sizes against a pre-determined upper and lower control limit.

If the initial bore is not within the required tolerance band, an automatic adjustment request is sent to the tool via wireless radio signal.

Return On Investment (ROI)

The table below outlines figures from **February 2015**, before implementation of Rigibore's Zenith solution and then again in **June 2015,** after three months of the Zenith Solution.

February 2015

Before Zenith			
Labels	Mach 1	Mach 2	Mach 3
Std. Dev	0.01342	0.00409	0.00925
C_p	0.32	1.06	0.47
C_{pk}	0.31	0.91	0.45
Yield	62.5%	99.0%	88.9%

June 2015

After Zenith			
Labels	Mach 1	Mach 2	Mach 3
Std. Dev	0.00289	0.00374	0.00121
C_p	1.50	1.16	1.21
C_{pk}	1.37	1.21	1.91
Yield	100.0%	100.0%	99.0%

Rigibore macro set an upper and lower warning limit on bore sizes, ensuring a narrow tolerance band, smaller deviation from nominal size and an increased C_{pk}. These pre-determined macros are customisable to customers tolerance requirements.