

無失誤的生產作業



五個步驟以達到零缺點的擰緊作業

給你一個全新的概念

包括：

- 介紹五個步驟以達到零缺點的擰緊作業
- 新的擰緊作業方式的優點
- 擰緊工具的管理及過程監控
- 防止失誤及生產線控制
-

Article number: 9833 1437 01

Error proofed production

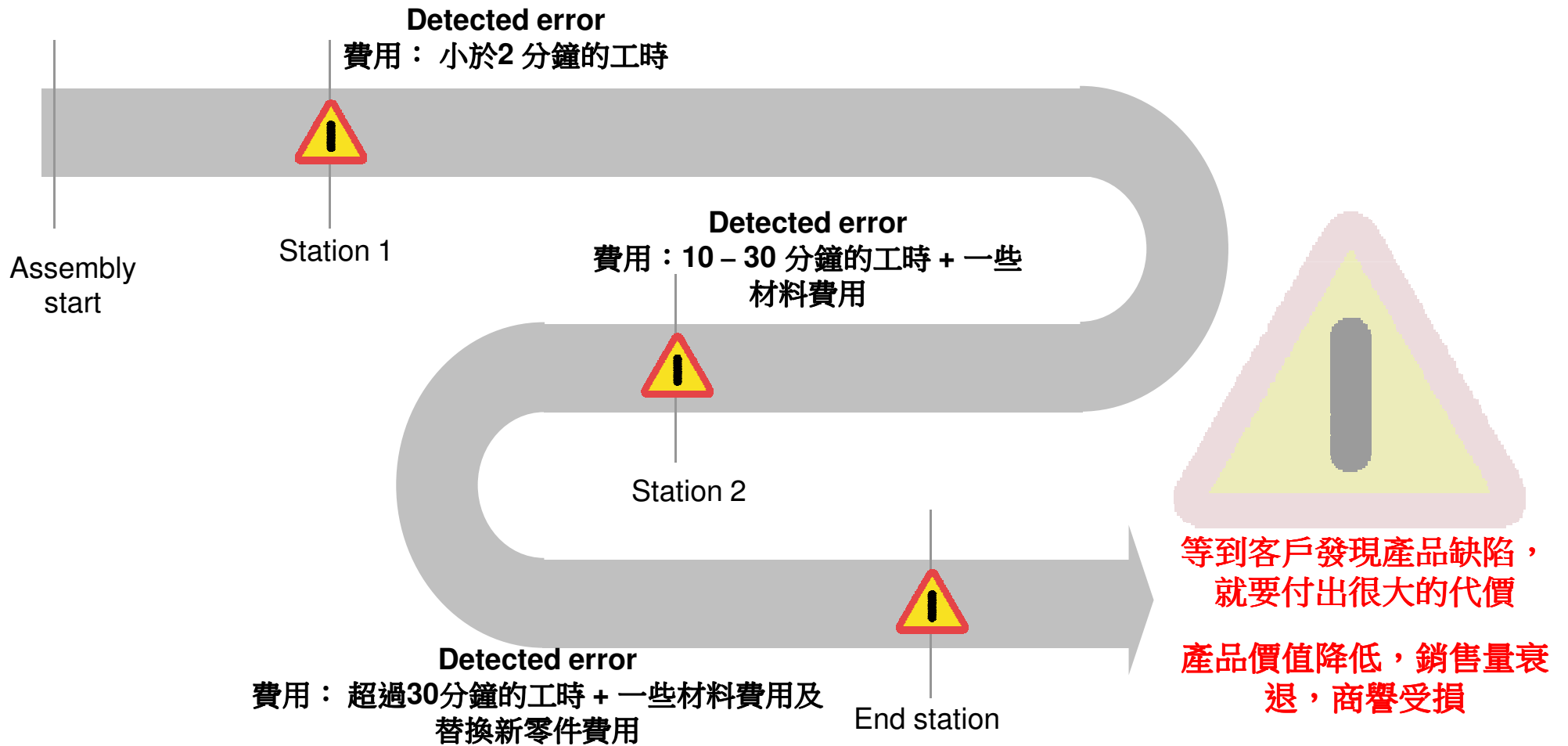
Five steps to achieve zero fault fastening



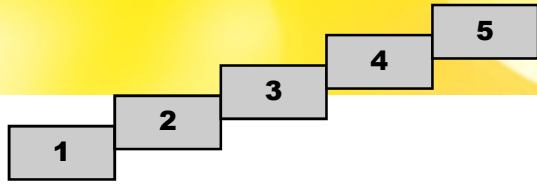
Atlas Copco



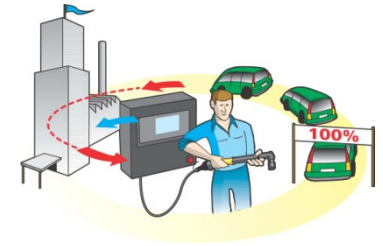
一個錯誤愈晚被檢出，其維修改正費用愈高



Five steps to achieve zero fault fastening



5 steps...



• **Step 1**
扭力值 OK!



• **Step 2**
螺絲數目 OK!



• **Step 3**
工件結合 OK! PF 4000 + Tensor ST

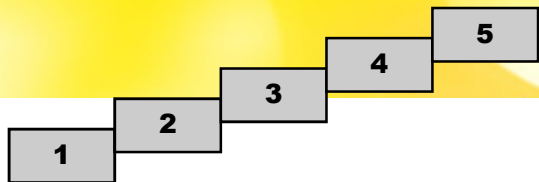
Tensor DS



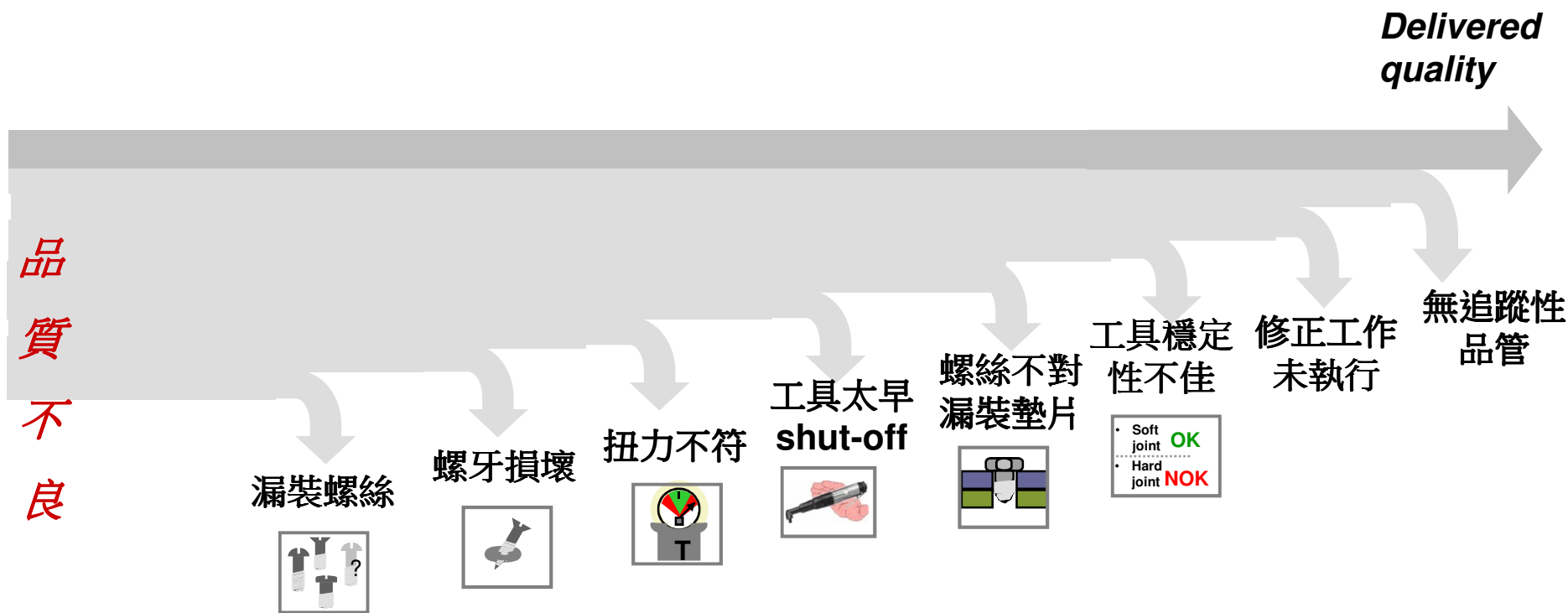
• **Step 4** 安全性
工件結合 OK! 網路控制
數據儲存

• **Step 5**
全廠零缺點
的擰緊作業

Shut-off Tool



一些生產線裝配常發生的問題點



1

2

3

4

5

Step 1. 確保一個正確的擰緊扭力值

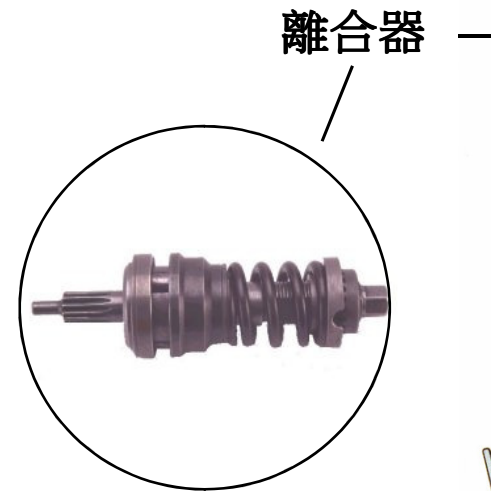
需要的設備：

- 選用Shut-off工具 (A tool that delivers a precise and predetermined torque)

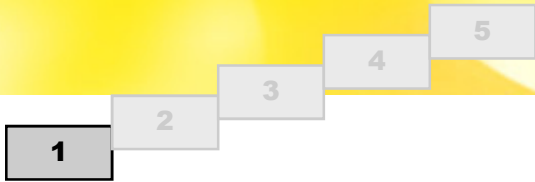
能得到品質的等級：

+ 依賴工具的精度 (Correct torque accuracy of the tool)

- 此階段並未考量到操作者因素及工件的因素

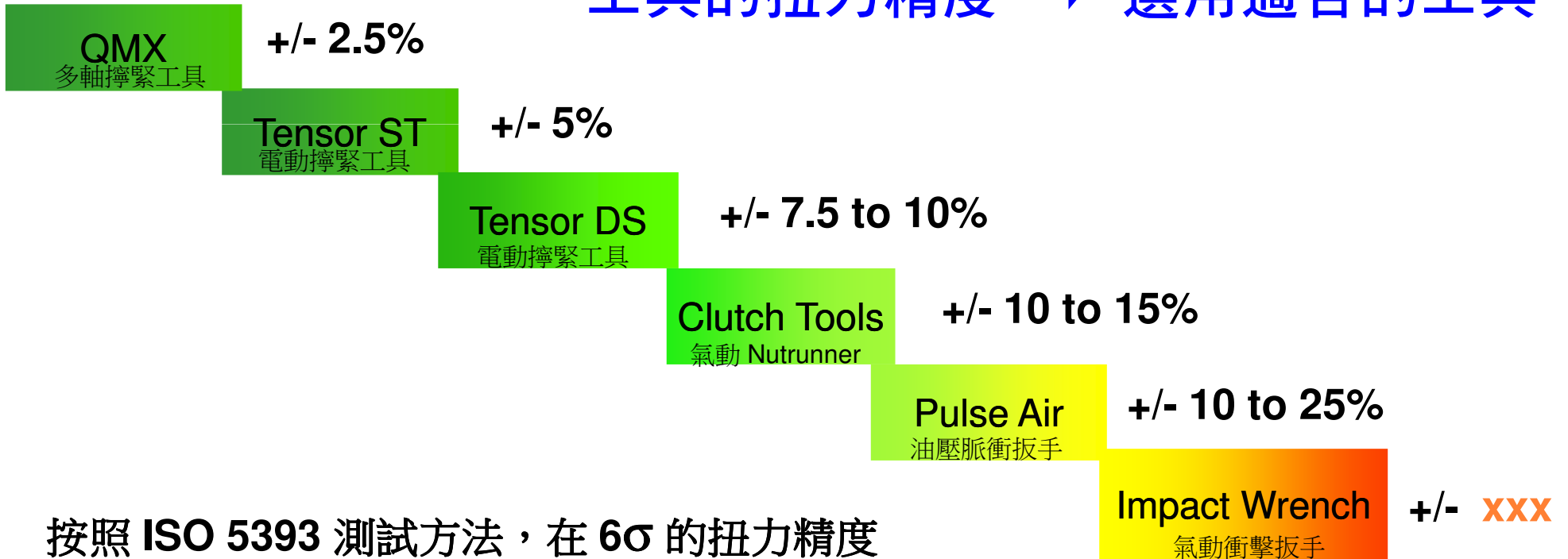


Five steps to achieve zero fault fastening



Step 1. 確保一個正確的擰緊扭力值

工具的扭力精度 → 選用適合的工具



按照 ISO 5393 測試方法，在 6σ 的扭力精度

Step 2. 確保所有的螺絲都已擰緊

需要的設備：

- 有自動計次的功能

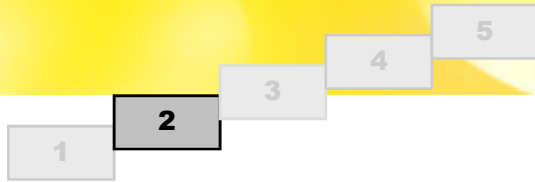
(使用RE型氣動工具 + 螺絲擰緊確認裝置)，稱為 POKAYOKE 或 防呆裝置

能得到品質的等級：

- + 依賴工具的精度 (Correct torque accuracy of the tool)
- + 所有的螺絲都鎖到 (All screws tightened)

– 請注意在此階段並未考量到工件的因素





Step 2. 確保所有的螺絲都已擰緊

使用螺絲擰緊確認裝置
(POKAYOKE) or 防呆裝置



防止 Re-hit



締付け確認ユニット
(ポカヨケユニット)
TFS-12

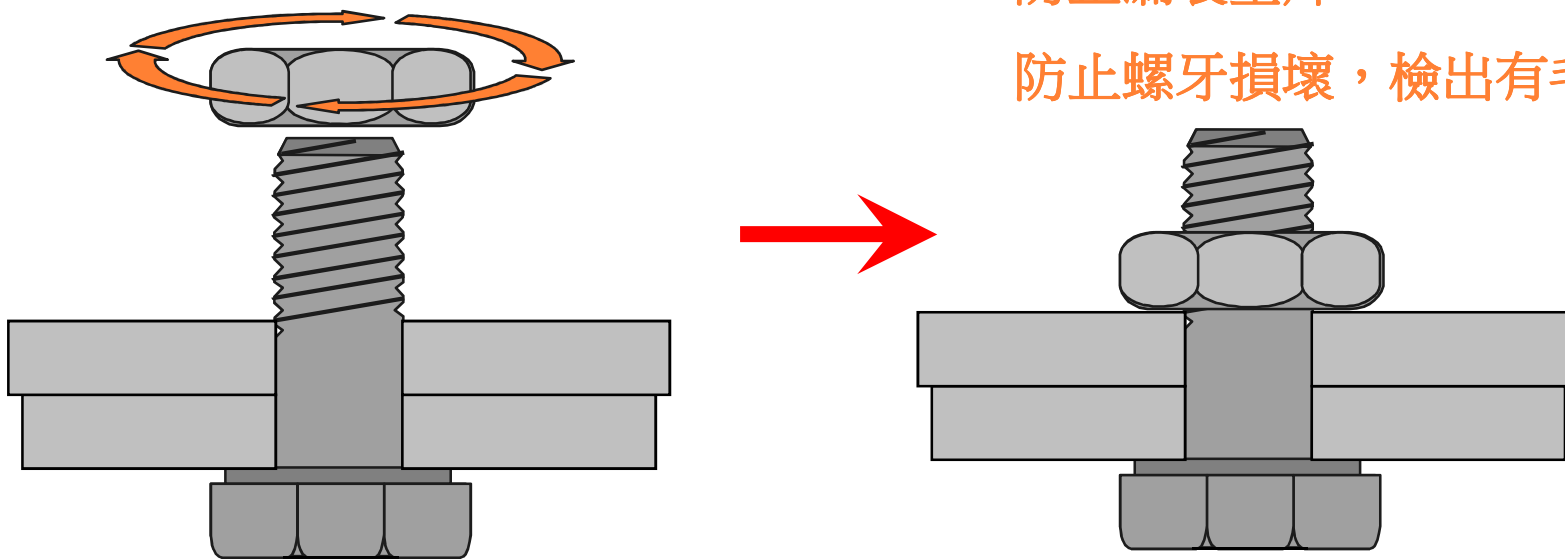


Step 3. 確保工件正確的擰緊，檢出不良的零件

- 你如何百分之百確定這一個螺絲已正確的鎖付旋轉至擰緊位置？

防止漏裝墊片，Seal

防止螺牙損壞，檢出有毛邊



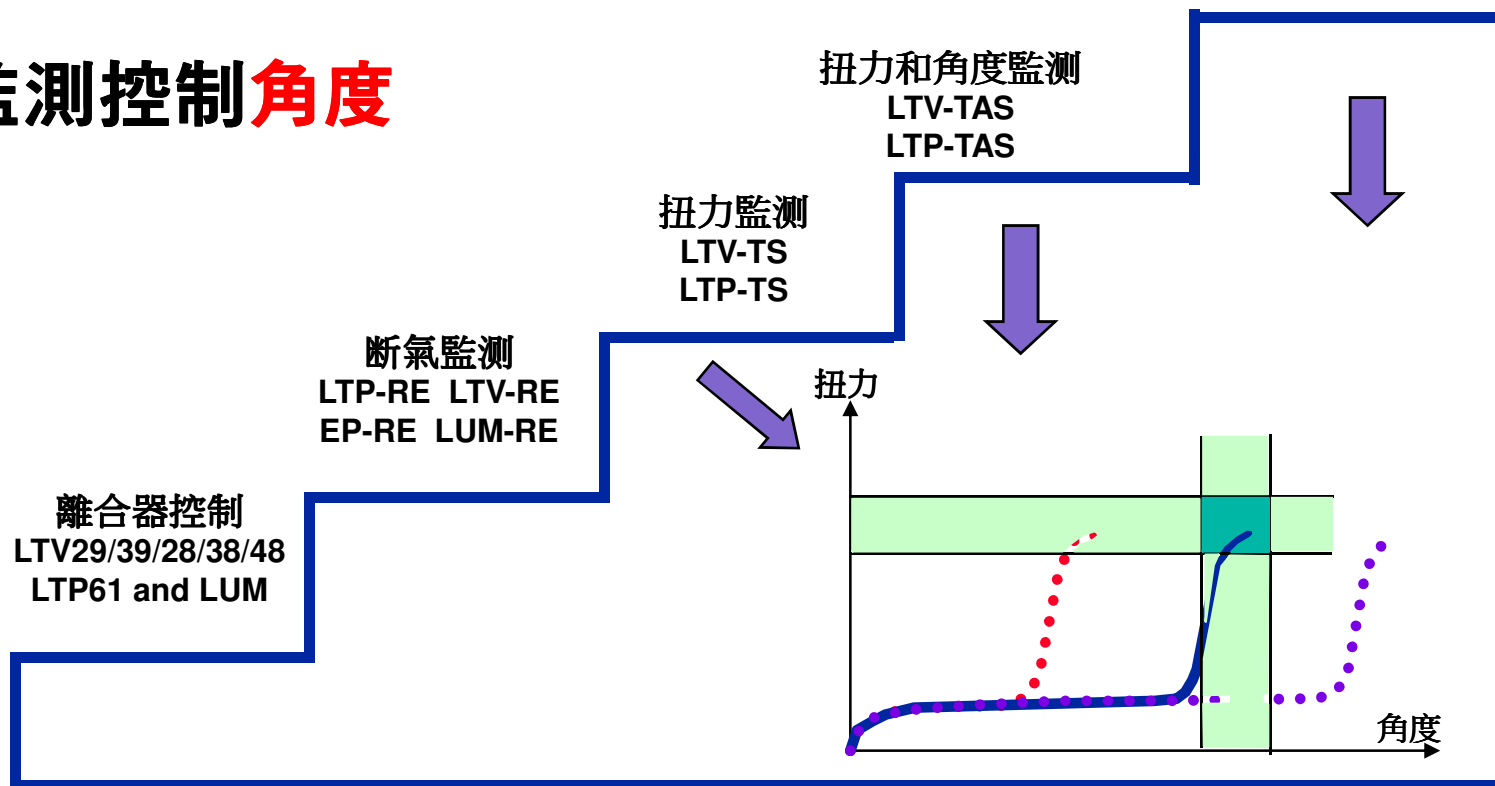
監控角度 i.e. 擰緊過程的旋轉角度

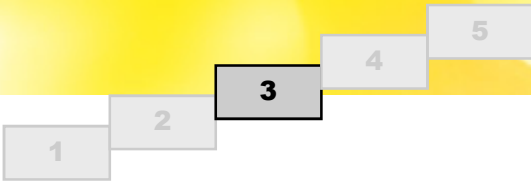
擰緊作業過程中的控制

監測控制**扭力**

監測控制**角度**

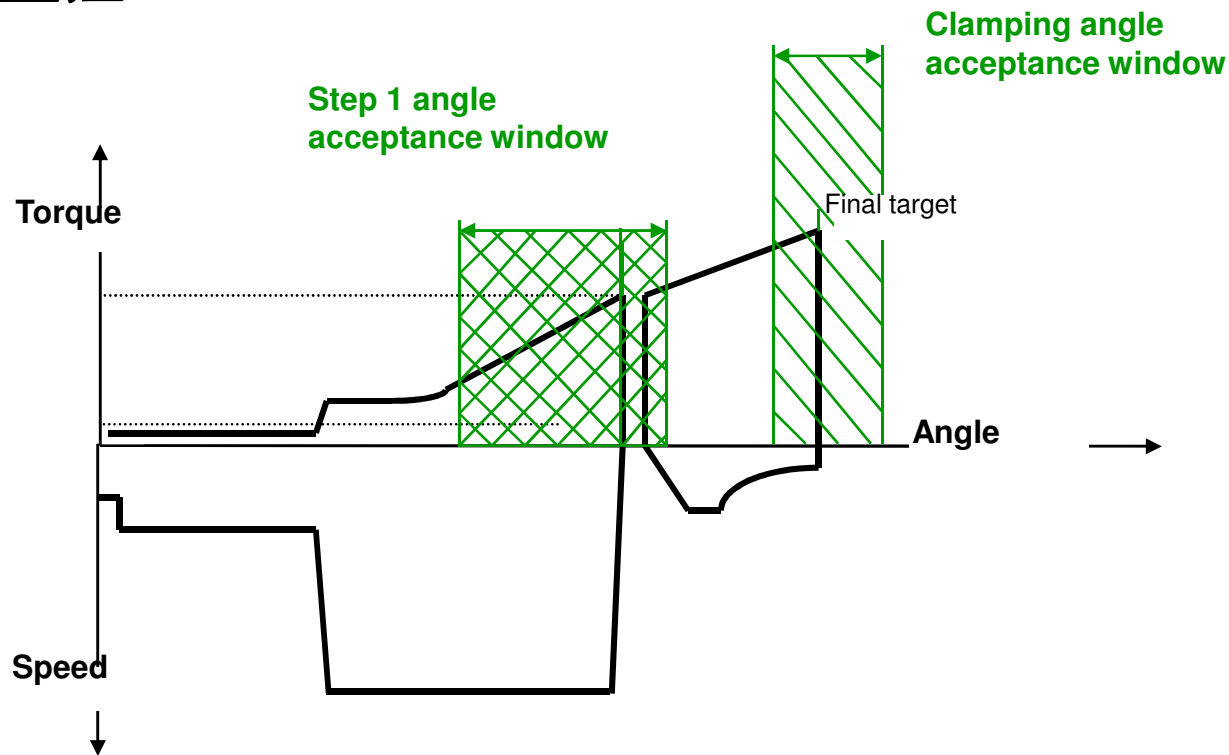
扭力和角度控制
Tensor DS, PF4000 + Tensor S
LMP61 - ITAS

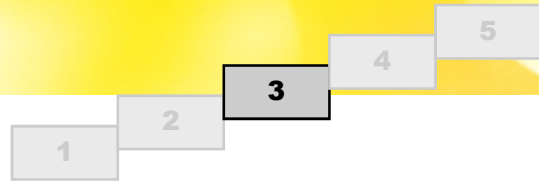




Step 3. 確保工件正確的擰緊，檢出不良的零件

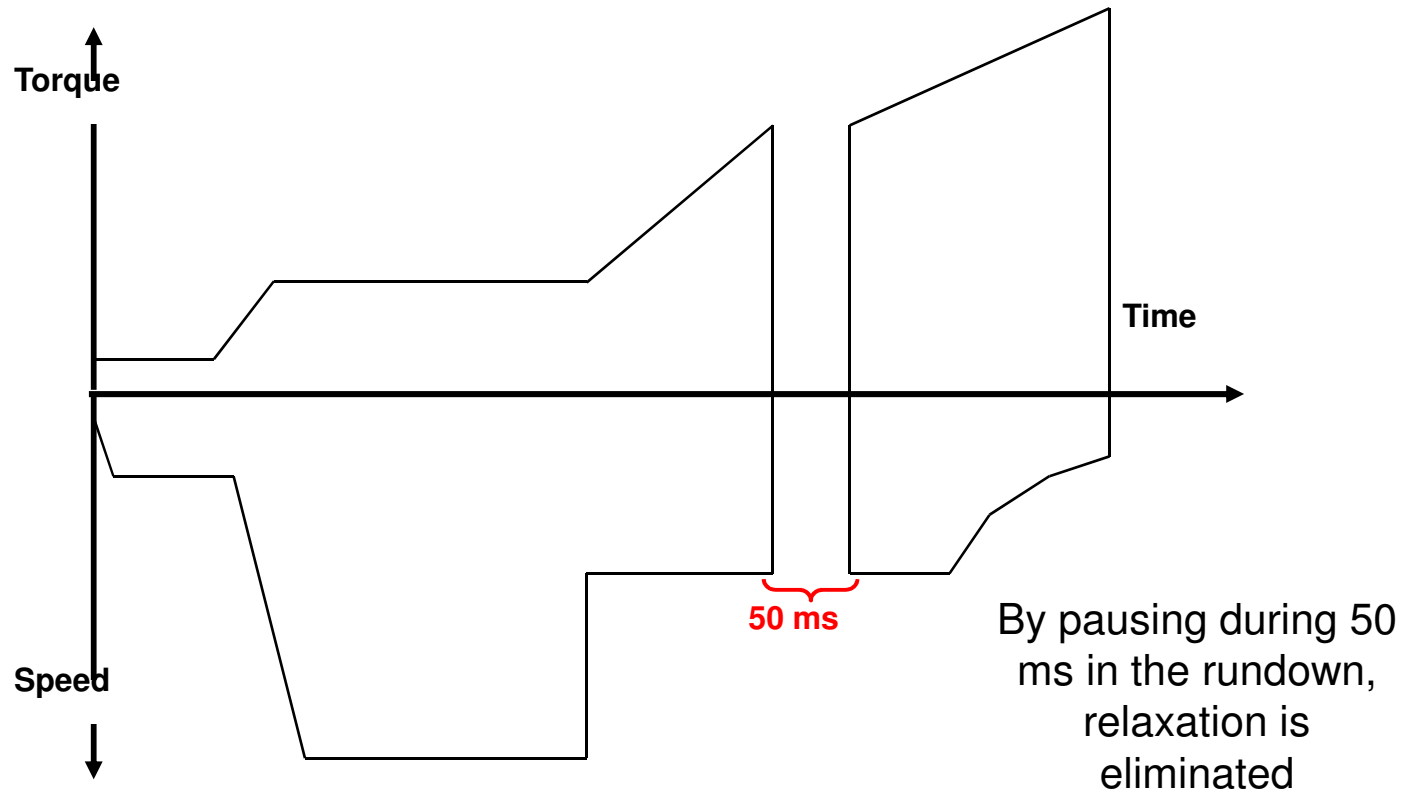
- 鎖付角度監控



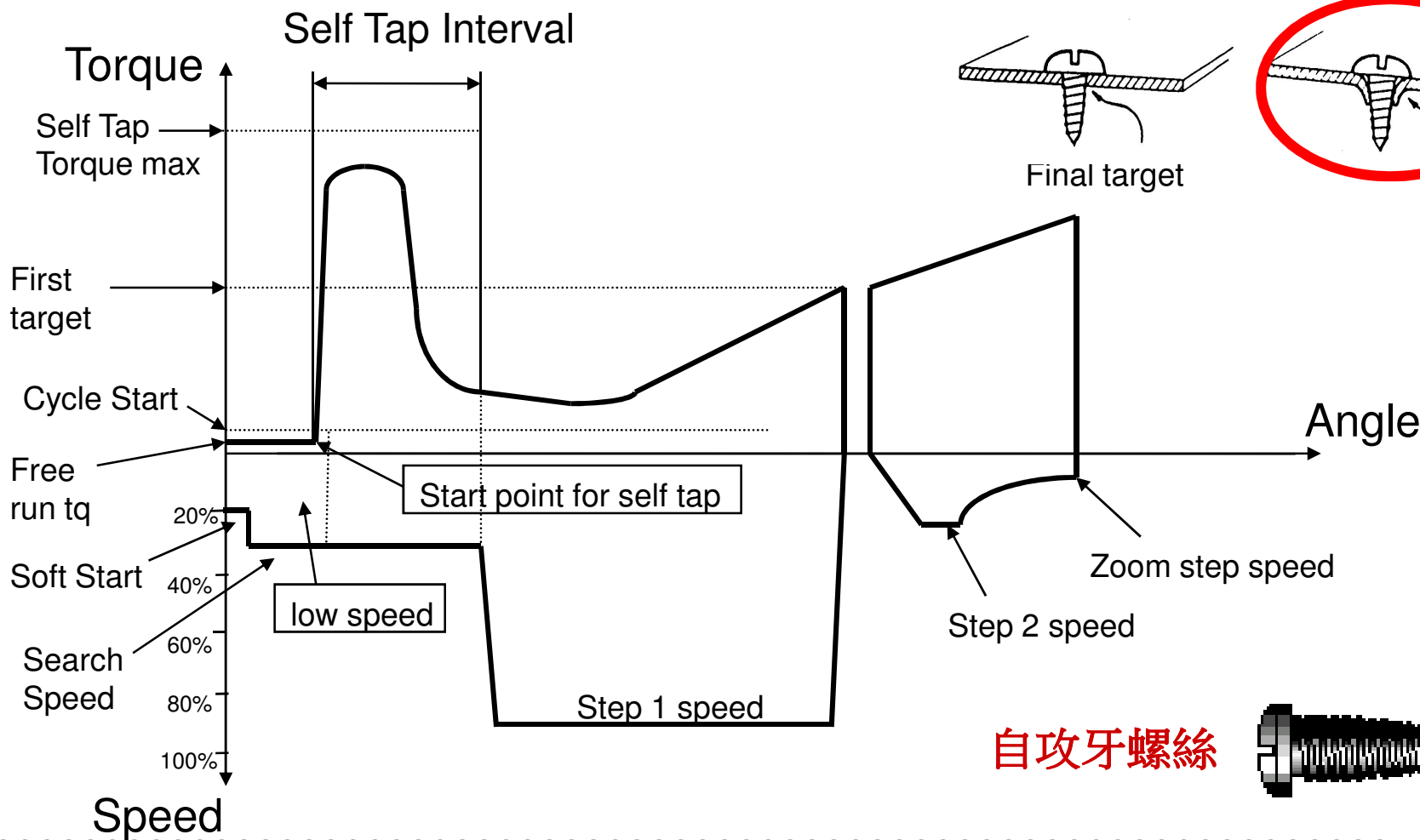


Step 3. 確保工件正確的擰緊，檢出不良的零件

- 兩階段擰緊 - 消除材料鬆弛 (Relaxation)



Step 3. 確保工件正確的擰緊，檢出不良的零件



自攻牙螺絲



1 2 **3** 4 5

Step 3.

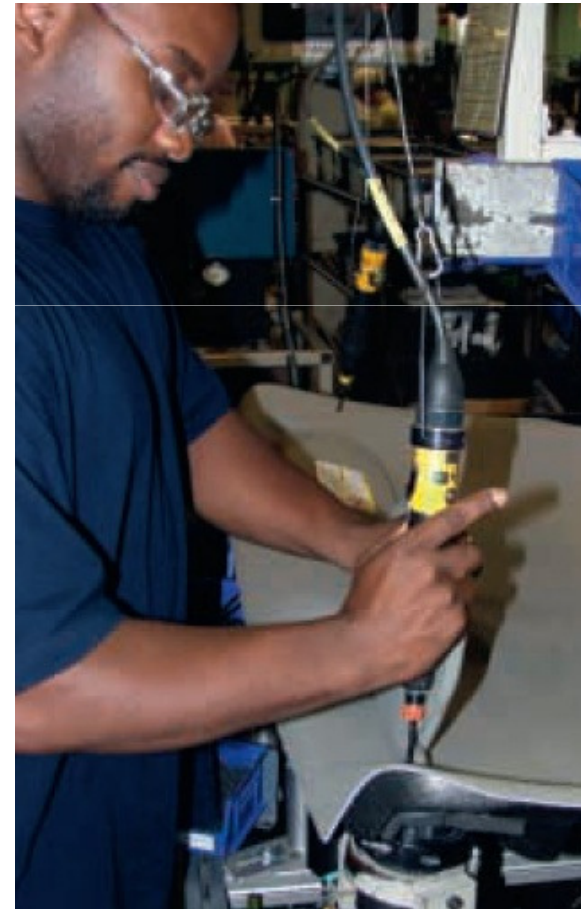
案例：Cutting cost and improving quality (Johnson Control, USA)

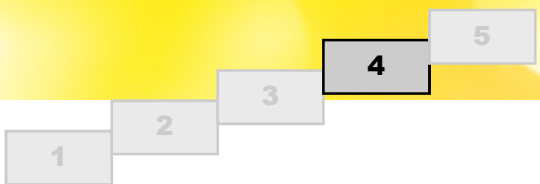
問題點：

- 擰緊過程產生 Overshoot (過扭)，造成工件龜裂
- 螺絲孔位沒有對正，造成螺絲未鎖到底

Solution: Tensor DS

- Slow stop speed of DS gives good accuracy and no cracked parts
- Low or High tightening is communicated to PLC, which locks the cycle and forces operator to take action → no final inspection needed
- One Tensor DS replaces 3 pneumatic tools → Lower maintenance cost





Step 4. 安全性工件已正確的擰緊，並記錄數據

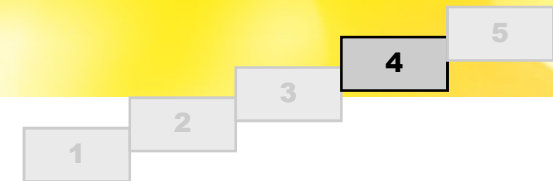
需要的設備：

- 利用扭力感應器來控制擰緊扭力，工具按規定作定期校驗
- 紀錄擰緊結果並收集成數據文件
- 統計分析，提供預警功能
- 全程監控整個擰緊過程

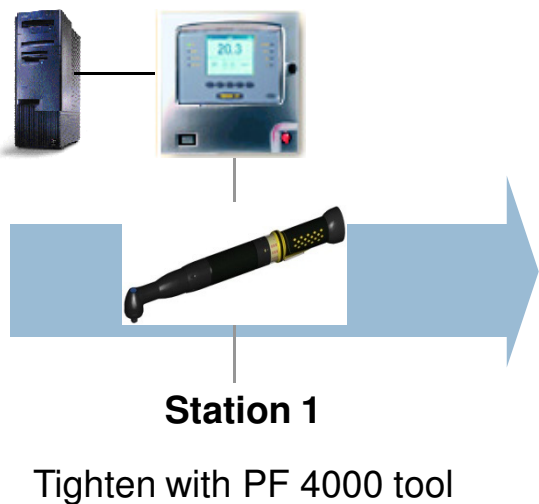
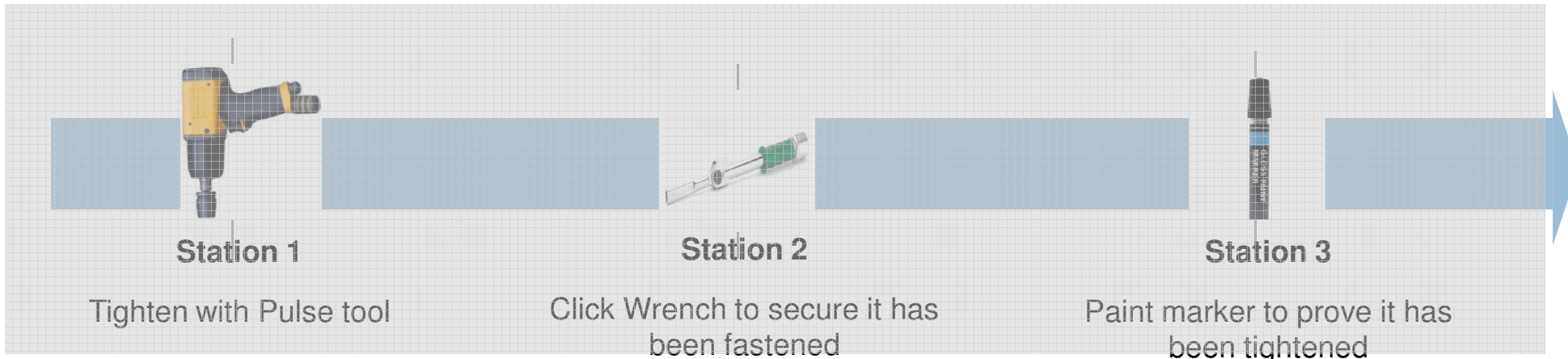


What is a safety critical joint? See the critical joint application guide on: www.atlascopco.com/criticaljoint

Five steps to achieve zero fault fastening



The right first time concept... 第一步就要做“對的方法”



- 工序減少 Fewer operations
- 減少人力 Less manpower
- 降低生產成本 Lower production costs
- 生產力提高 Better productivity
- 減少問題 Reduced ergonomic problems
- 縮短生產線長度 Shorter production lines !

操作者的素質



The right first time concept...

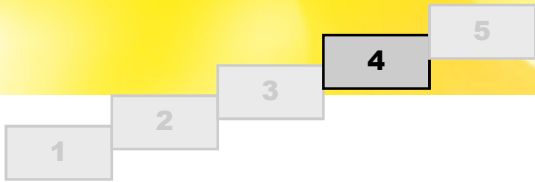
第一步就要做“對的方法”

案例說明

- Fiat (飛雅特) Tychy plant (Poland)
- 每部車子的裝配工時共 22,7 小時
- 安全性工件 (**Safety Critical Joints**) 螺絲擰緊，取消用扭力扳手再校驗動作
- 改善擰緊方式共減少 45 分鐘的工時
- 總工時縮短 3 %
- 裝配總工時縮短 5 %

Tensor ST electric tools increase productivity & save money !

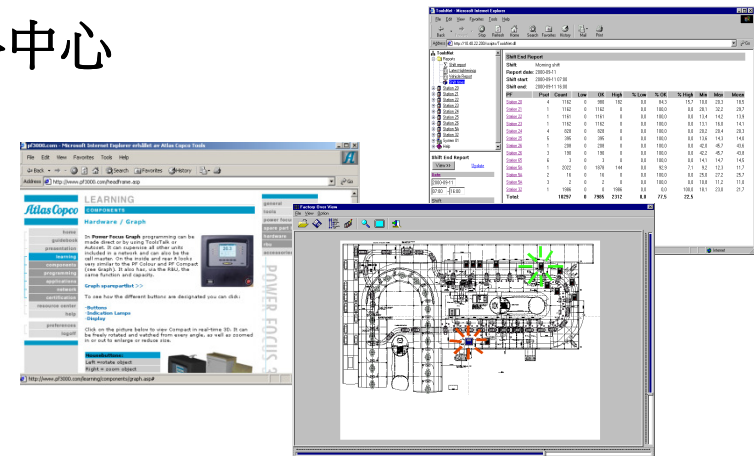
汽車的生產有14%的成本是人工費用 !!!

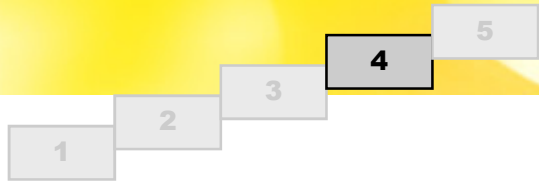


Step 4. 安全性工件已正確的擰緊，並紀錄數據

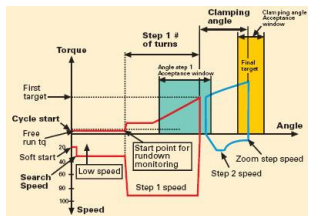
PF 4000 + Tensor ST for your safety critical fasteners:

- 可追溯性的擰緊數據 (via a transducer which is calibrated)
- 數據儲存在控制器中，包括日期、時間、車身號碼 VIN number
- 數據可傳送到全廠統籌的數據資料中心





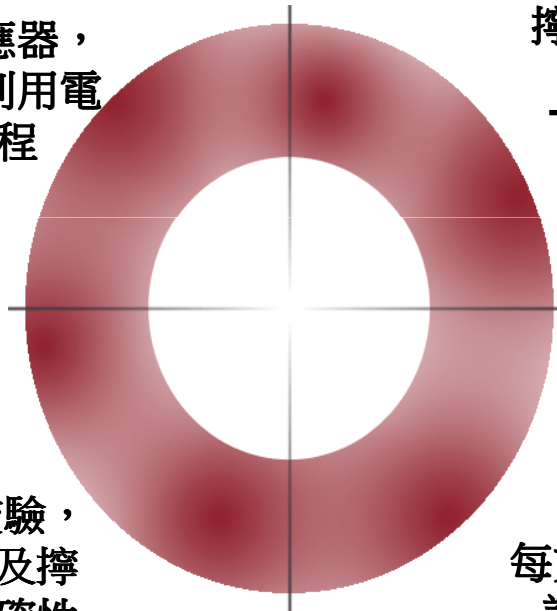
PF 4000 採用完整，可追蹤性的擰緊過程



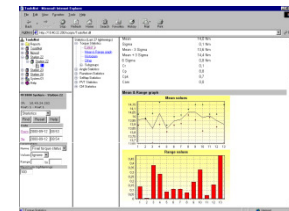
工具附加扭力感應器，
締付過程監控及利用電
流監控擰緊過程



嚴謹的扭力校驗，
確認扭力值及擰
緊程序的正确性



擰緊數據儲存在
PF 4000 and
ToolsNet 4000



每支工具定期校驗
記錄都保留存檔



扭力量測的架構

扭力校驗 (Calibration)

可追溯性 (Traceability)

信賴度 (Accredited)

ISO 17025

ISO
國際標準

國際品管要求標準

ISO 6789

Atlas校正實驗室
&
國家度量衡標準實驗室

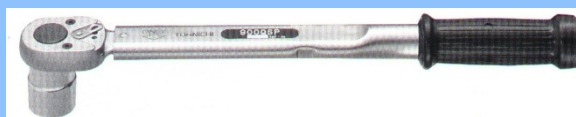
國家品管要求標準

ISO 5393



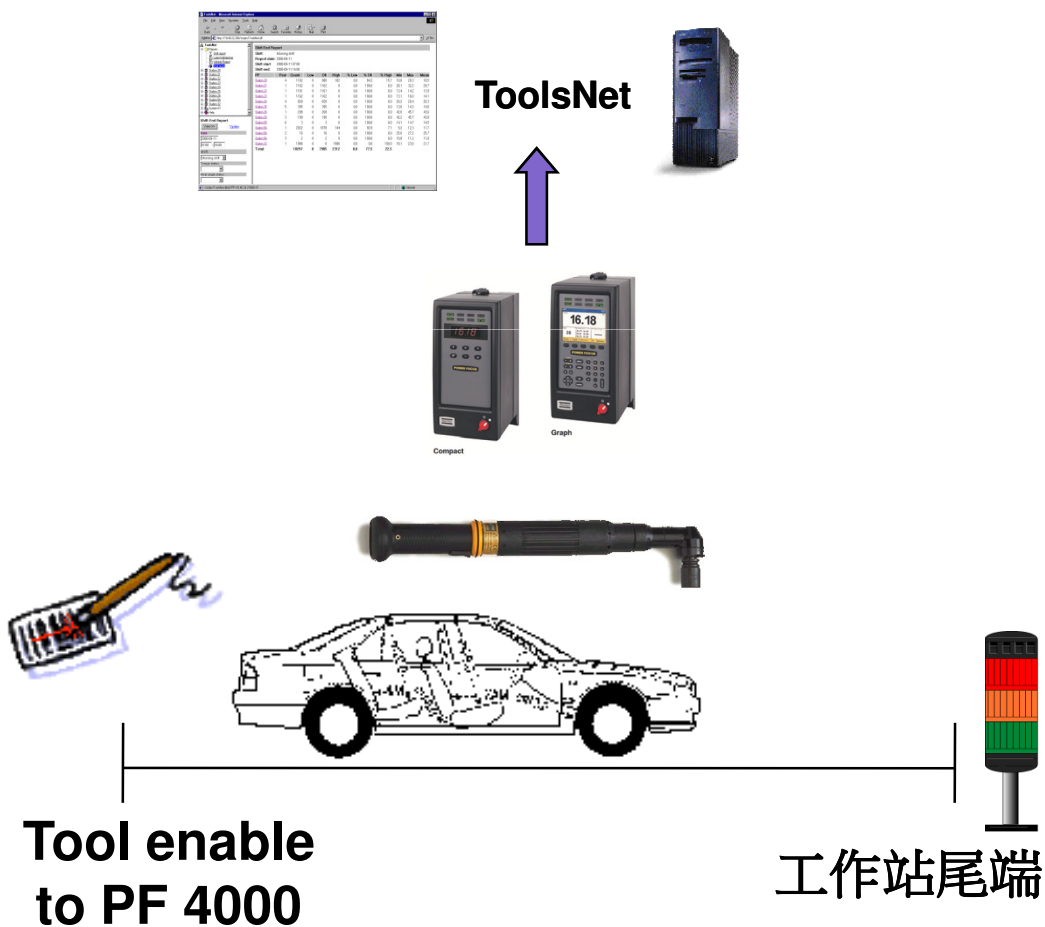
工廠品管要求標準

裝配手冊

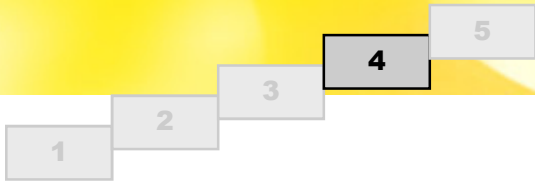


現場管理

案例：PF 4000 內建生產線控制功能

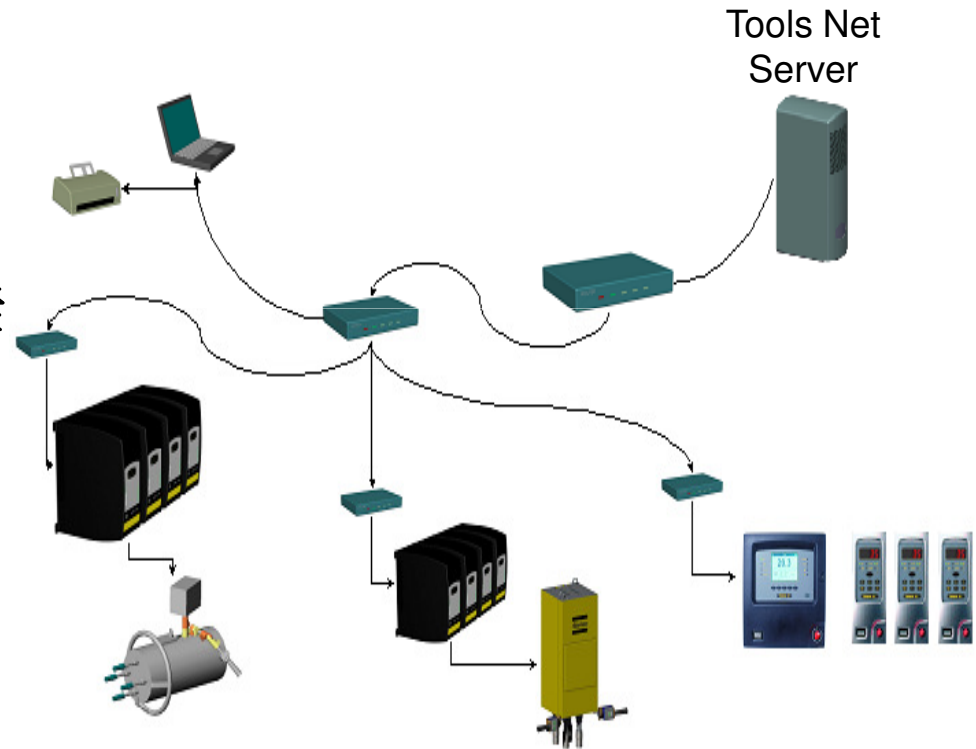


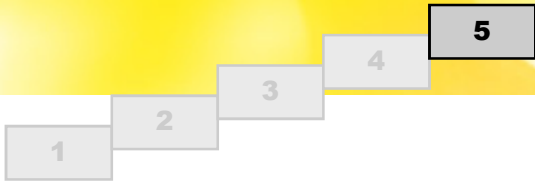
1. 車身進入該工作站 – 啟動條碼掃描器的功能
2. 用掃描器掃描車身條碼 – 能自動選擇：
扭力參數 / 螺絲批量數 / 工作次序 / 群組次序，
工具可以開始使用
3. 操作者開始擰緊作業
4. 所有的擰緊數據傳輸到 ToolsNet 的資料庫
5. 當工作程序(Job) = OK，工具就不能再作動，
等待下一部車身
6. 假如車身已移動到工作站尾端而仍未完成整個
工序，則PF控制主機發出警示 Alarm



ToolsNet 4000 - “所有的擰緊數據紀錄在文件檔案”

- 可以自動從 PF4000 與 PowerMACS 的控制主機抓取資料
- ToolsNet 儲存每一個擰緊數據，包括：時間、日期、零件標示號碼、工具序號、擰緊過程曲線圖、..... etc.
- 很容易在database中搜尋資料
- 標準規格式的報表





Step 5. 全廠網路監控，達到零缺點的擰緊作業

以上四個步驟是針對每一個單一工序，不讓NG件流到下一工序

Step 5 是將所有工序結合起來

Systems required:

- 把整個工廠連成一個網路監控
- 工件辨識系統來切換扭力參數
- 不合格件的流程，追蹤及改正



1

2

3

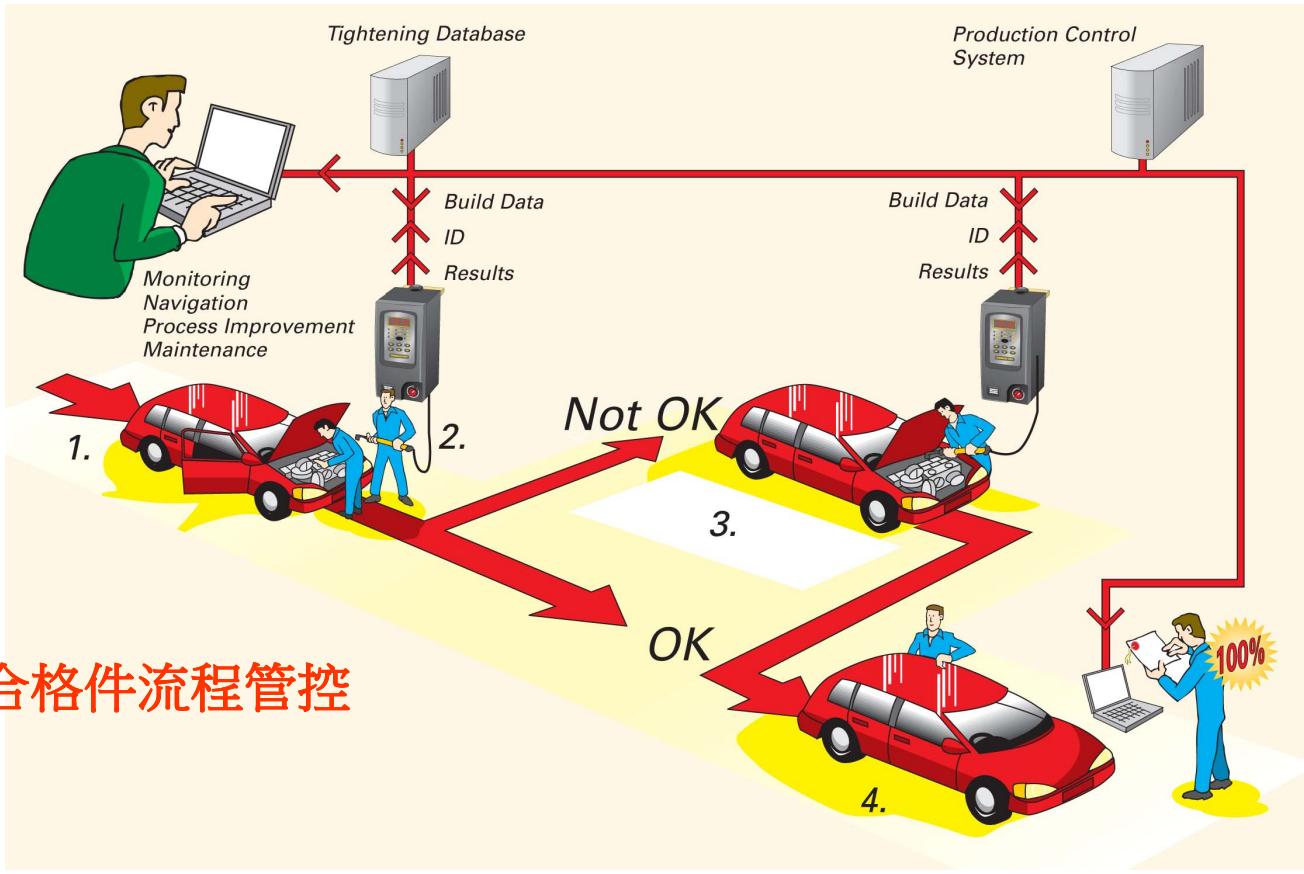
4

5

Five steps to achieve zero fault fastening

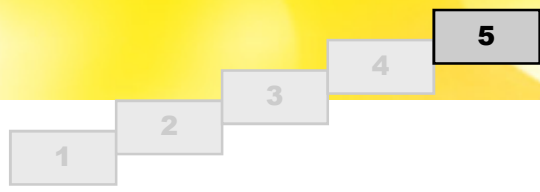


Step 5. 全廠網路監控，達到零缺點的擰緊作業



不合格件流程管控

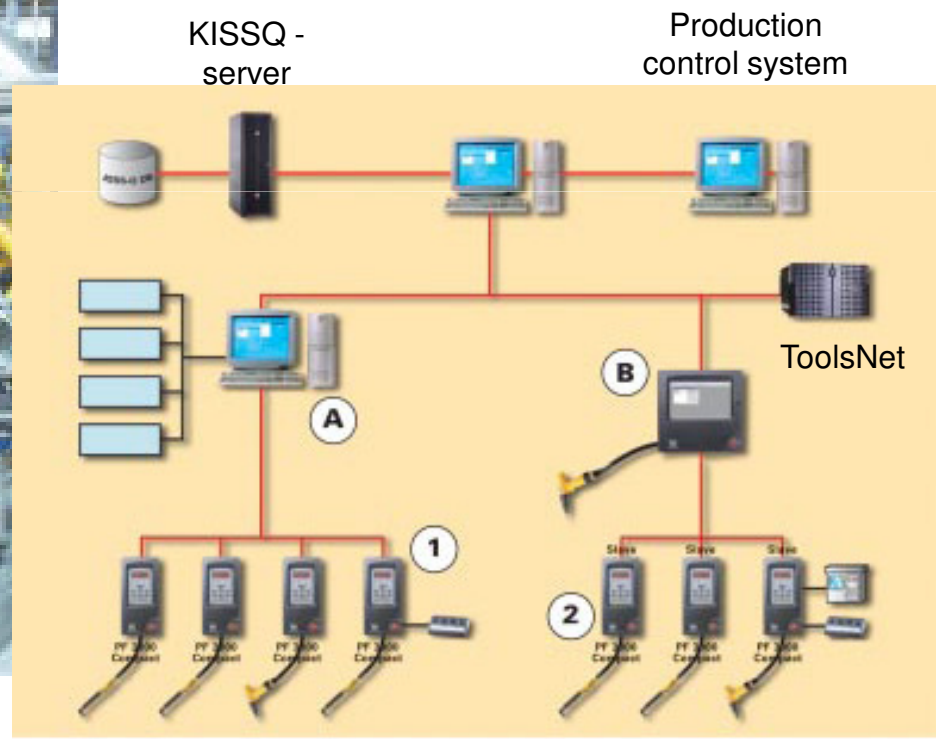




Five steps to achieve zero fault fastening

Step 5.

案例：BMW – KISSQ Kernfertigung Integrierende Steuerungssystem Qualität



總結：5 steps...



- 採用精準且可調整扭力的工具

- 依賴操作者的技藝

• 扭力值 OK !



- 螺絲計次
- 防止 Re-hits
- 檢出 Bad joint

• 螺絲數目 OK !



- 監控擰緊角度
=> Joint control
- 擰緊過程模式選定
- 檢出不良的零件

• 工件結合 OK !



- 儲存擰緊數據
- 可追溯性的管理
- 定期校驗

• 安全性工件結合 OK !



- 全廠生產線網路連線
- 工件辨識系統
- 不合格件追蹤及改正

• 零缺點的擰緊作業

已使用“零缺點的擰緊作業”的世界各大汽車廠

| VW | VW | GM | GM | Ford | Ford | Mercedes | Chrysler |
|----|----|----|----|------|------|----------|----------|
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| | | | | | | | |
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已使用”零缺點的擰緊作業”的世界各大汽車廠

| BMW | Peugeot | Citroën | Renault | Honda | Toyota | Subaru | Paccar |
|-----|---------|---------|---------|-------|--------|--------|--------|
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使用高效率工具對環境及減碳的影響

Towards Sustainable Productivity

A guide to reduce your environmental footprint





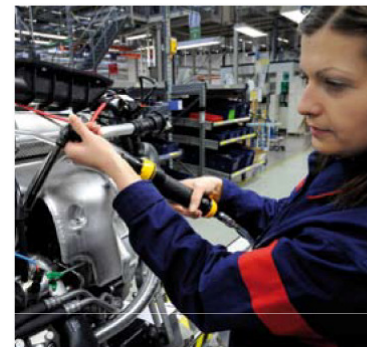
使用高效率工具對環境及減碳的影響

Improve the efficiency of your air line

改善空氣管路的效率

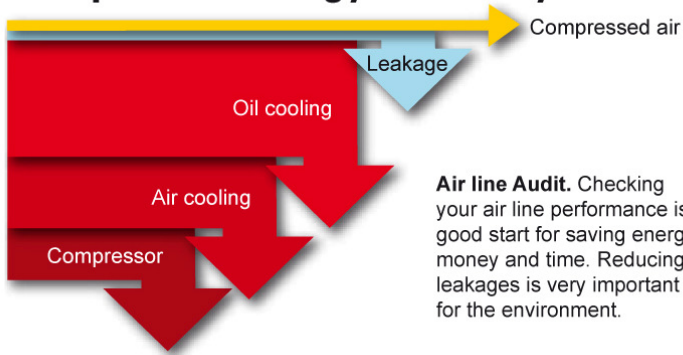
There is a huge amount of energy wasted by leakages due to less than optimal installation. But, in fact, this can be prevented quite easily. For example, using high flow couplings attached to the correct size of hoses, and having the correct regulators in place, can result in significant energy cost savings and increased productivity.

Using just one bar more of pressure than what's needed unnecessarily increases air pressure by 16% - which directly translates into higher energy consumption and costs. Having the correct regulators alone can go a long way towards reaching peak efficiency and energy savings. In addition, good installation also improves overall productivity by allowing workers to accomplish more in fewer hours.



1 CO₂ TONNES -350
38% EFFICIENCY INCREASE

Compressor energy efficiency



Air line Audit. Checking your air line performance is a good start for saving energy, money and time. Reducing leakages is very important for the environment.

Air line Accessories. High flow couplings, correct-sized air lines and regulators are key to achieving peak performance.



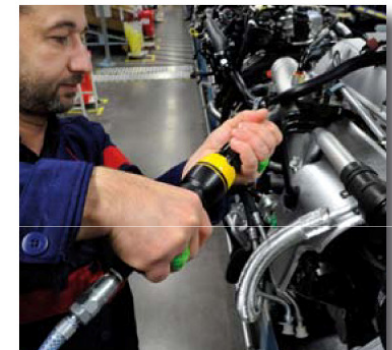
使用高效率工具對環境及減碳的影響

Put the most effective air tools to work for you

採用高效率的氣動工具

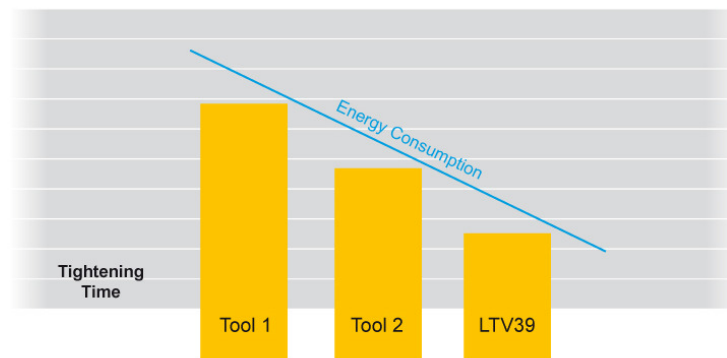
Greater speed is the beginning of a winning formula. For example, by choosing a nutrunner from Atlas Copco's LTV-series you may be able to increase speed by up to 50%. Naturally this dramatically shortens tightening cycles while also increasing productivity.

It's also interesting to evaluate how this greater speed impacts energy consumption. Since the tool performs twice the work with the same amount of power, it's easy to see the benefit – a given increase in speed is directly matched by an equal percentage of savings in energy.



1 CO₂ TONNES -30%
50% EFFICIENCY INCREASE

Speed is the key



使用高效率工具對環境及減碳的影響

Migrate to electrical tools

改用電動擰緊工具

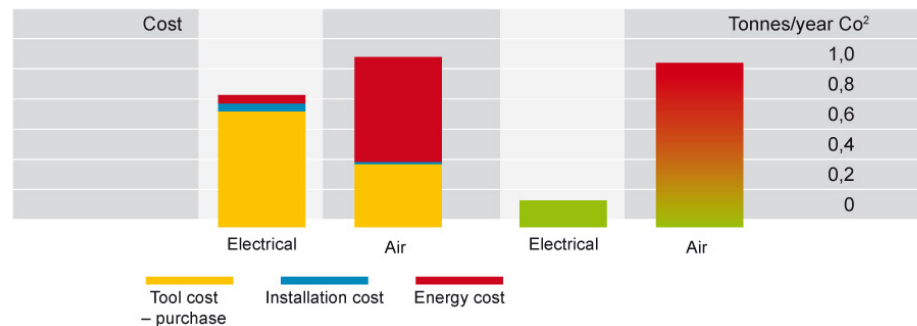
Tools powered by compressed air have a lot of positive benefits to offer you – including proven durability and easy operation. However, they also consume up to 20 times more energy than their electrical counterparts. Which is why migrating to electric tools makes so much sense in both the short-term and the long run.

Electric tools are more comfortable to work with, they vibrate less and make less noise. In larger, advanced industrial production facilities, they also offer traceability and quality monitoring. All of this adds up to helping achieve sustainable productivity.



CO₂ EMISSIONS **-85%**
85% EFFICIENCY INCREASE

Tool cost and environmental impact



Making the transition from air to electric tools benefits both business and the environment.


使用高效率工具對環境及減碳的影響

CO₂ neutral tightening

改用充電式電動擰緊工具

The biggest impact on energy savings you can get is by powering your production line with solar panels or windmills. The evolution of tools from those that are powered by air and electricity, to ones that operate on batteries, makes this possible and translates into greater savings. By developing tools such as these, with renewable energy, the savings are immediately evident and lasting. In addition, these advanced tool solutions mean that sustainability can be put in place without sacrificing practicality or productivity. This is just one more leading example of how we are committed to making positive, long-lasting impacts on the industries who rely on our tools - every day.





**We are committed to your superior
productivity through
interaction and innovation.**

通過互動與創新，我們承諾您實現卓越生產力。



Atlas Copco



我們的專業

僑誼實業股份有限公司是國內專業氣動工具廠商：



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