

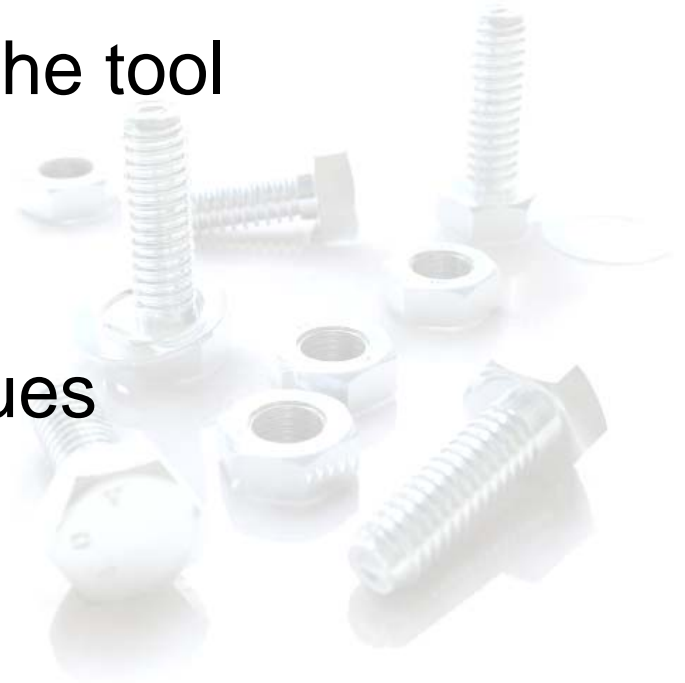


# Simon Cole

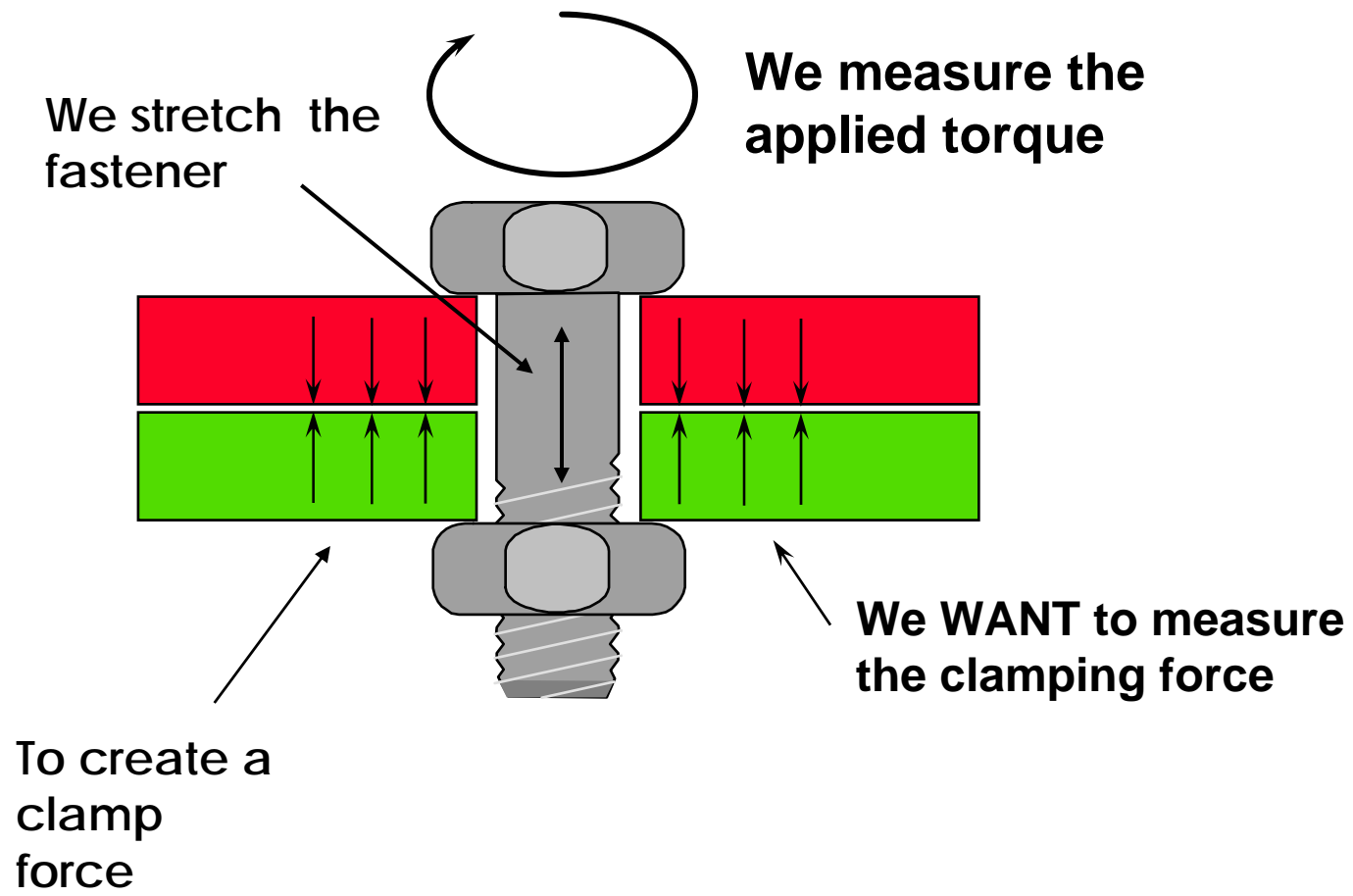
- Engineering Apprentice
- 15 yrs experience with nut running systems
- Working for the leader in motor vehicle threaded fastener assembly tools & systems

# Topics for discussion

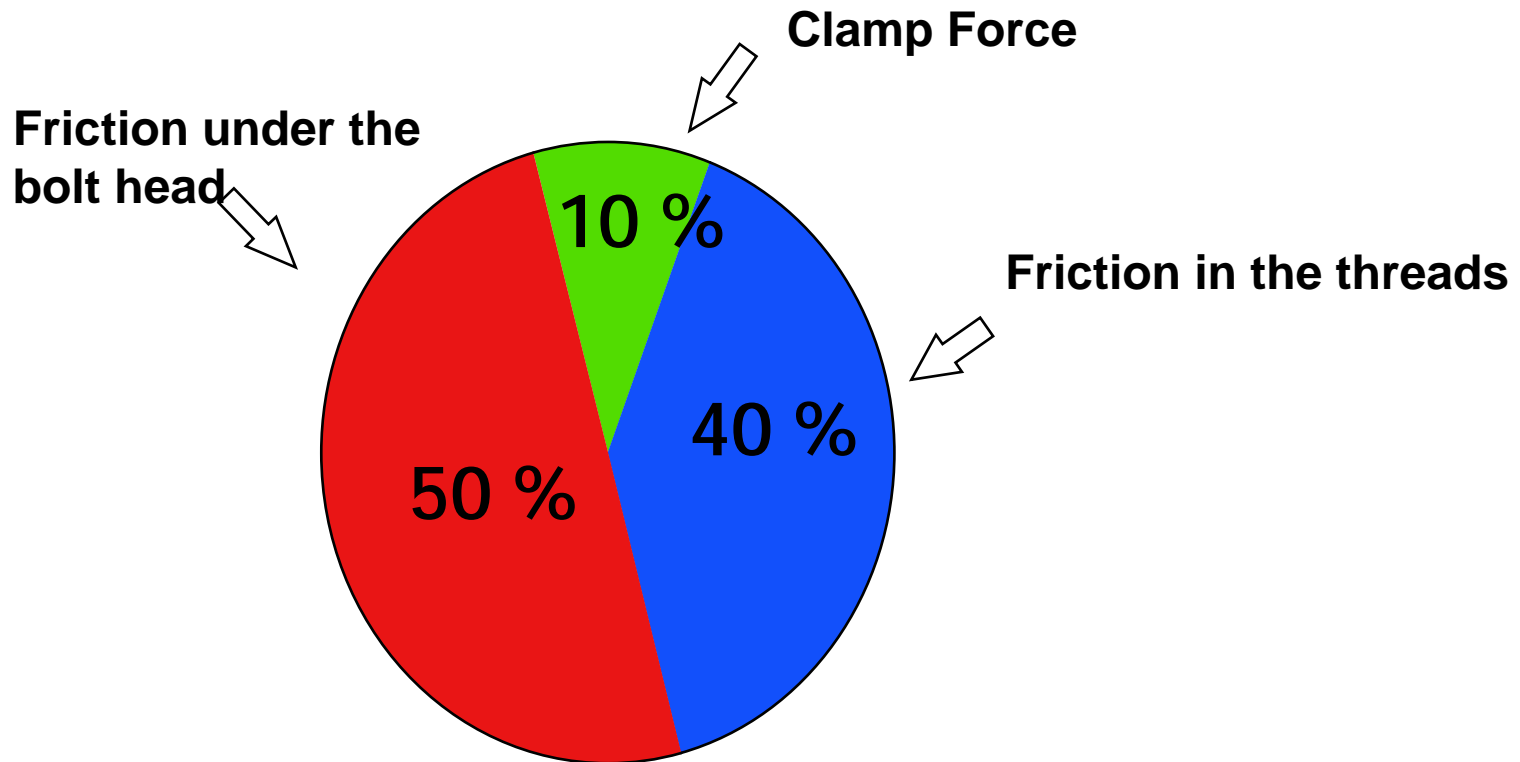
- Threaded fastener basics
- How different joints affect the tool
- Tightening strategies
- Tool selection
- Motor Vehicle Industry issues
  - Traceability
  - Zero fault production
  - CR6+Free coatings



# The threaded fastener



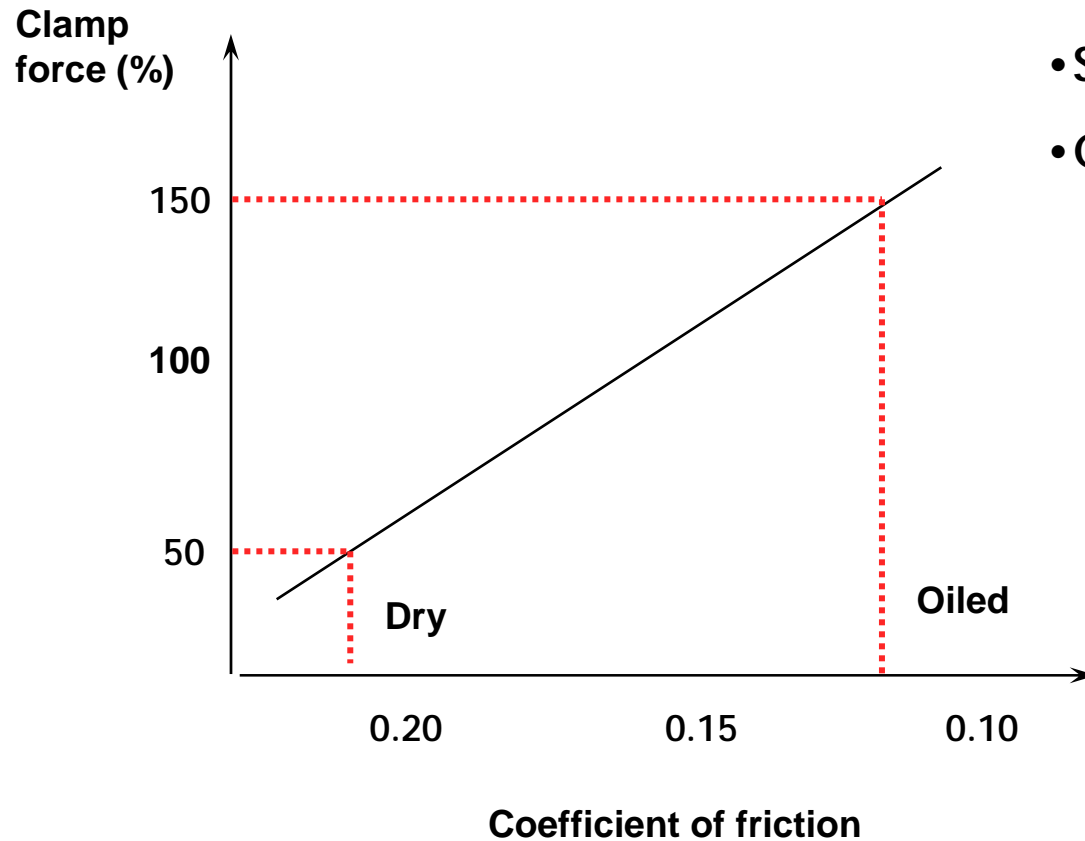
# Relationship between applied Torque and resulting Clamp Force



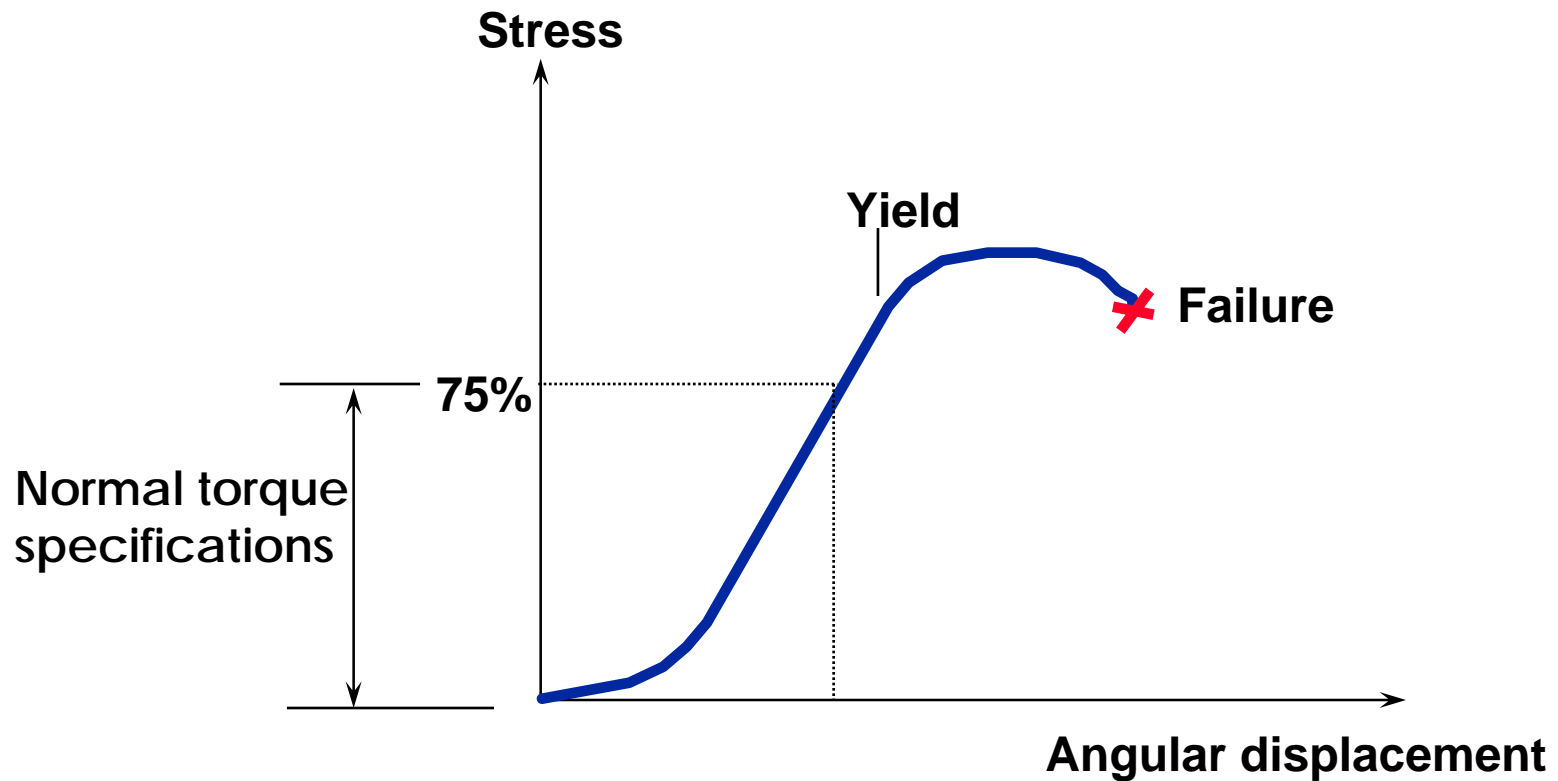
# Effects of friction on clamp force

Friction variables:-

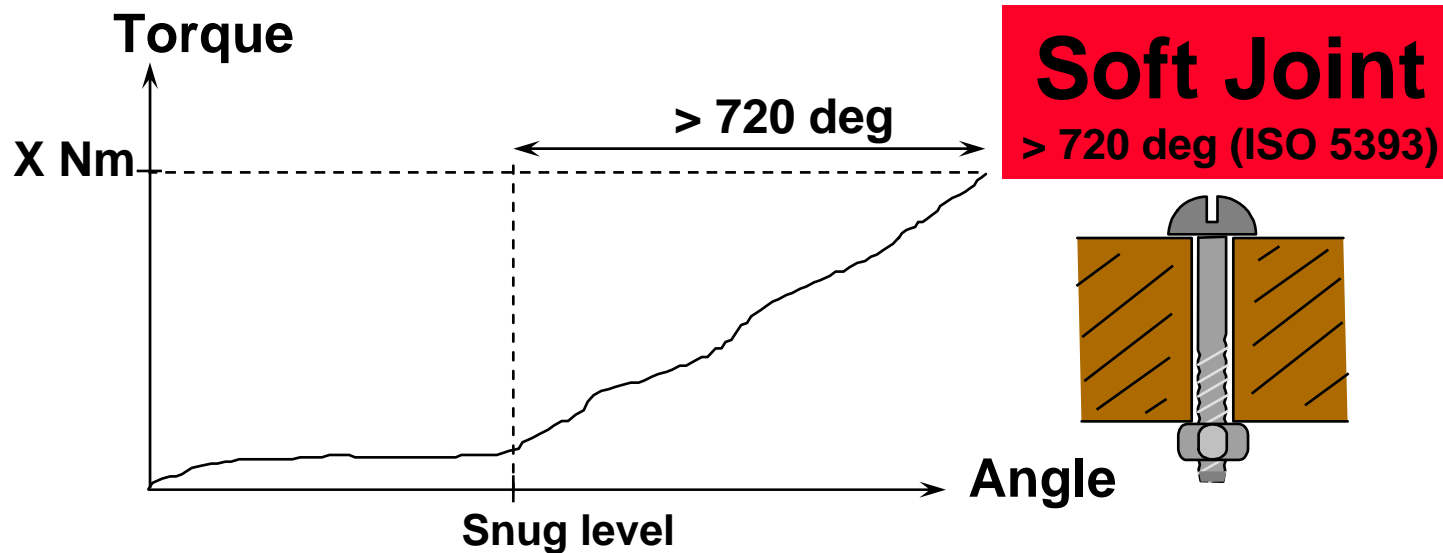
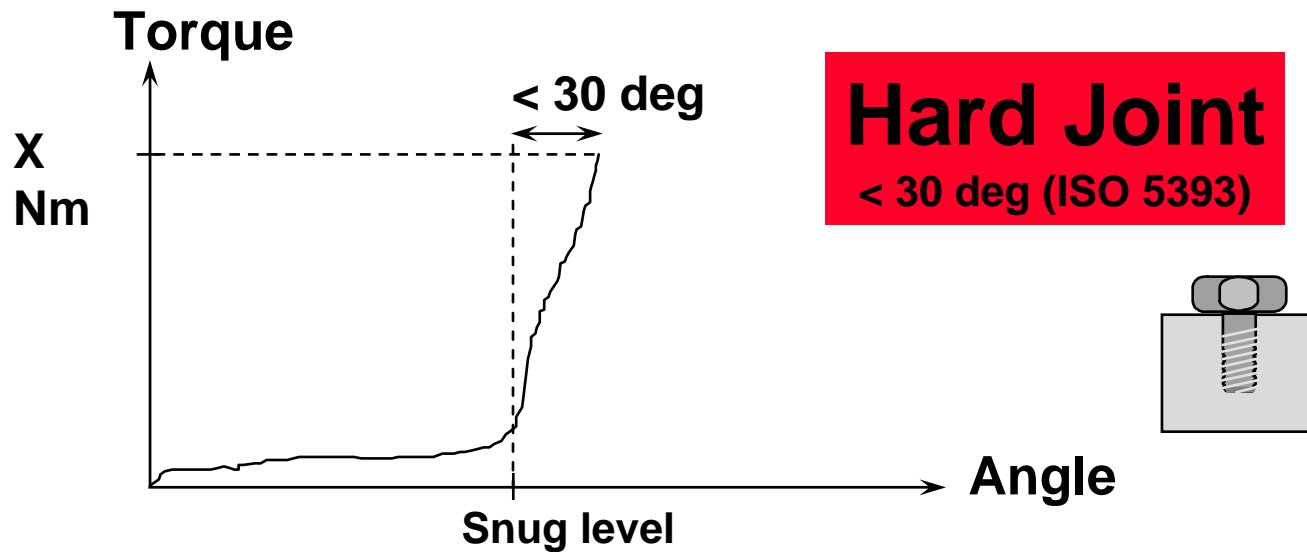
- Bolt coating
- Lubrication
- Surface finish
- Component Alignment



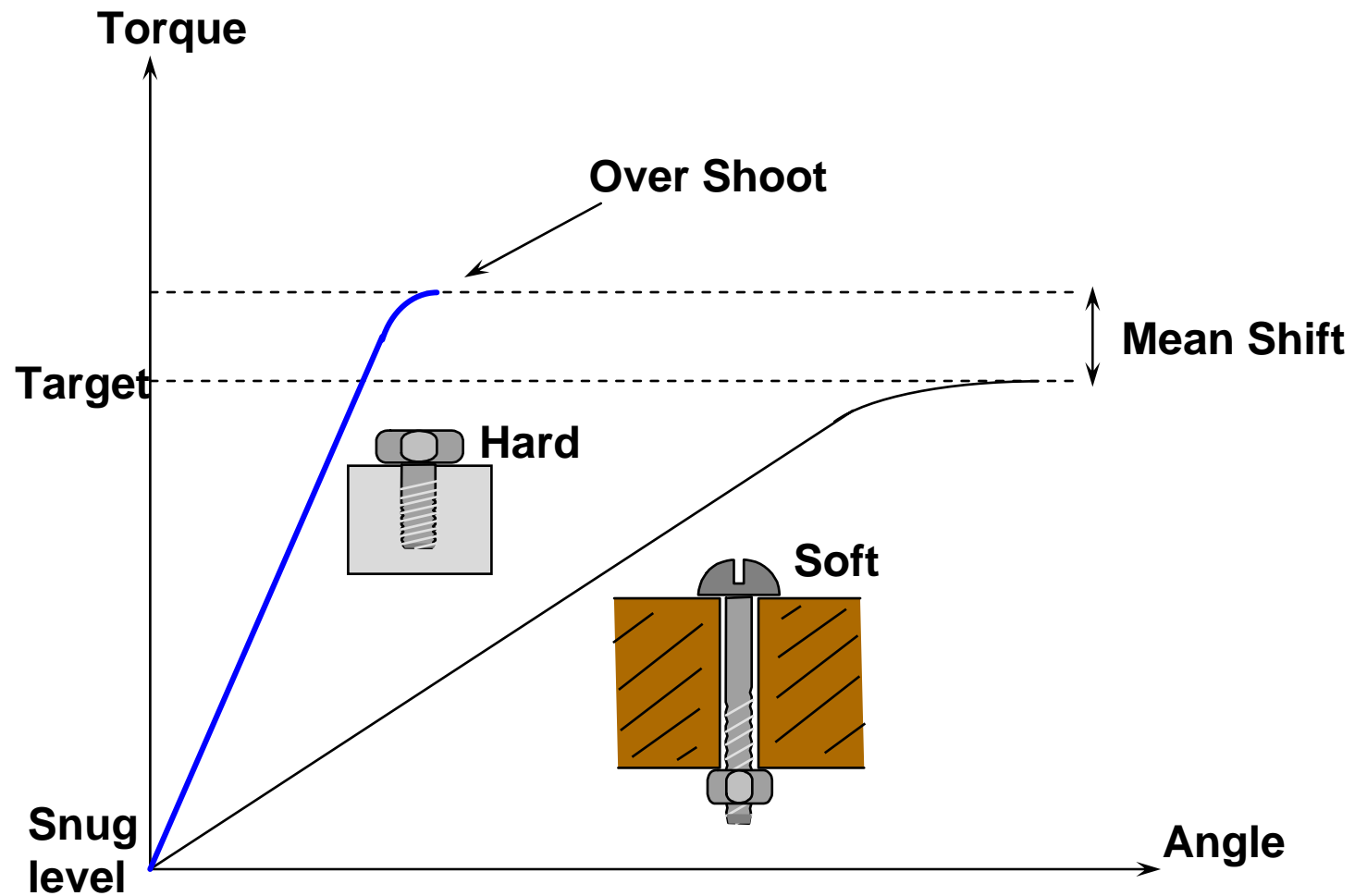
# Tensile Stress / Yield Stress



# ISO 5393 – Testing of threaded fastener power tools

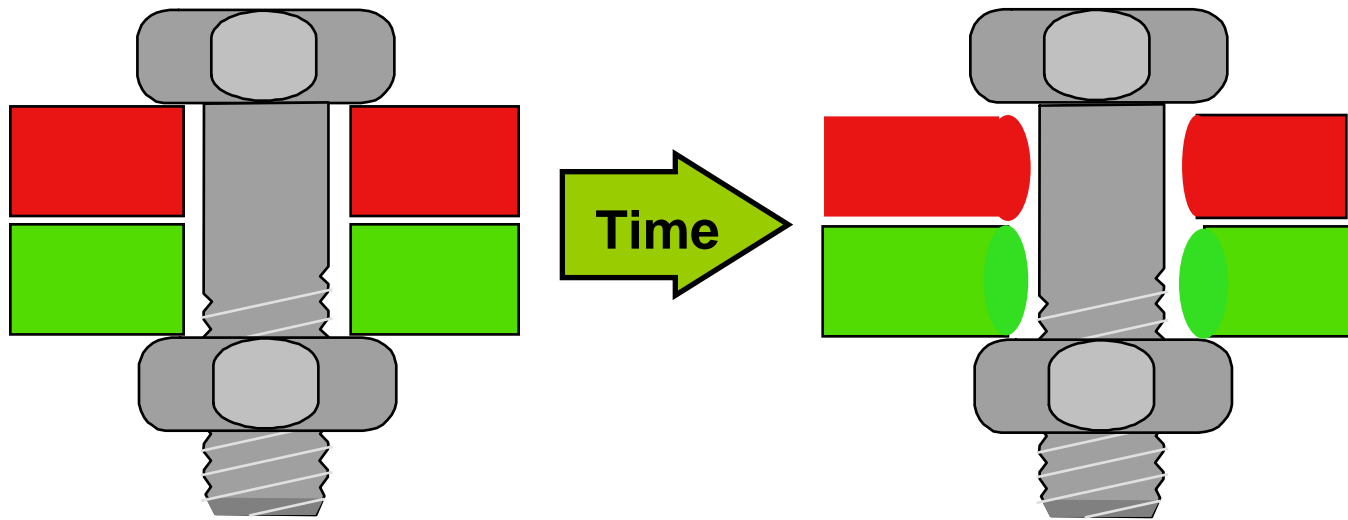


# Hard and Soft joints





# Relaxation



**The material relaxes and you  
risk to loose clamping force!**

# Combating Relaxation

- Increase installation torque
- Retightening the fastener
- Using two stage fastening with a relaxation pause
- “Dynatorque”
- Joint conditioning



# Prevailing torque

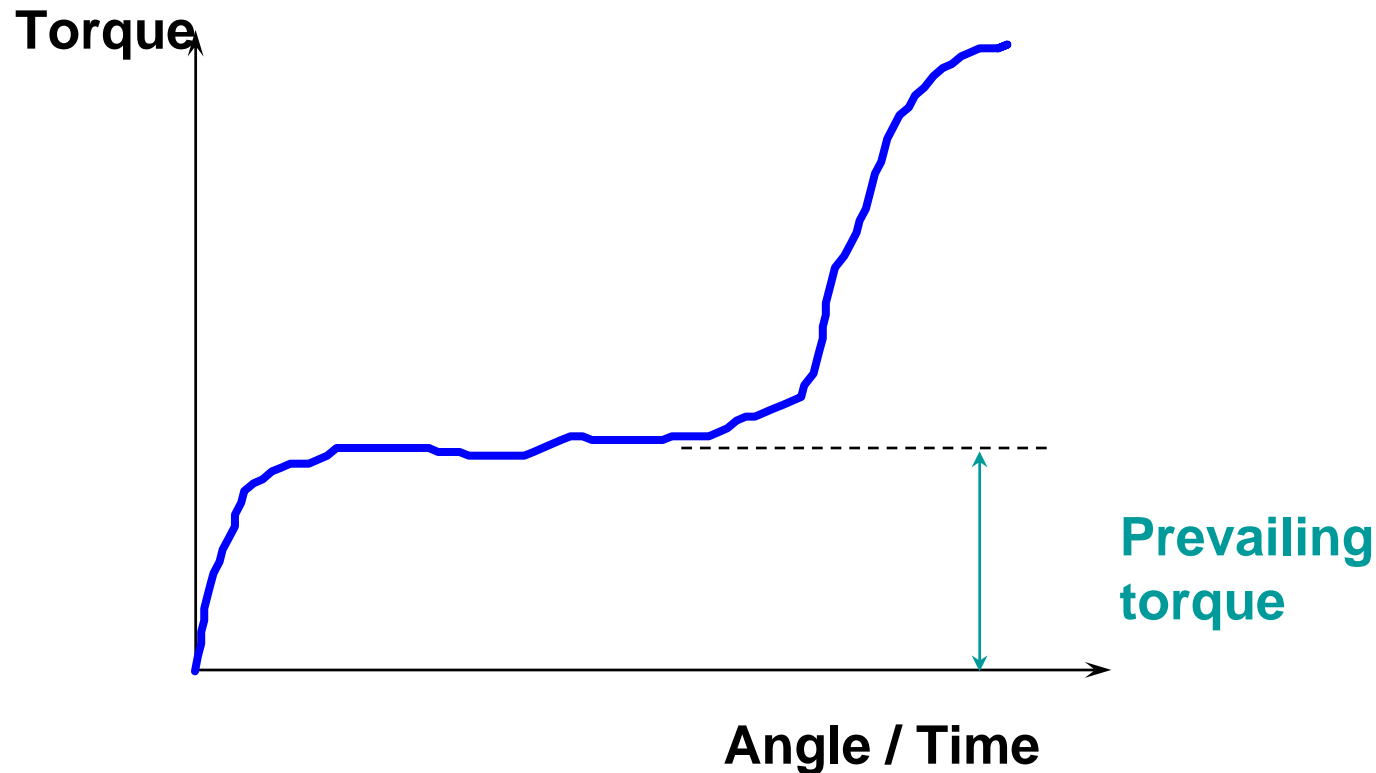
Torque to drive the fastener due to :-

- Thread locking systems
- Thread forming screws
- Misalignment of parts

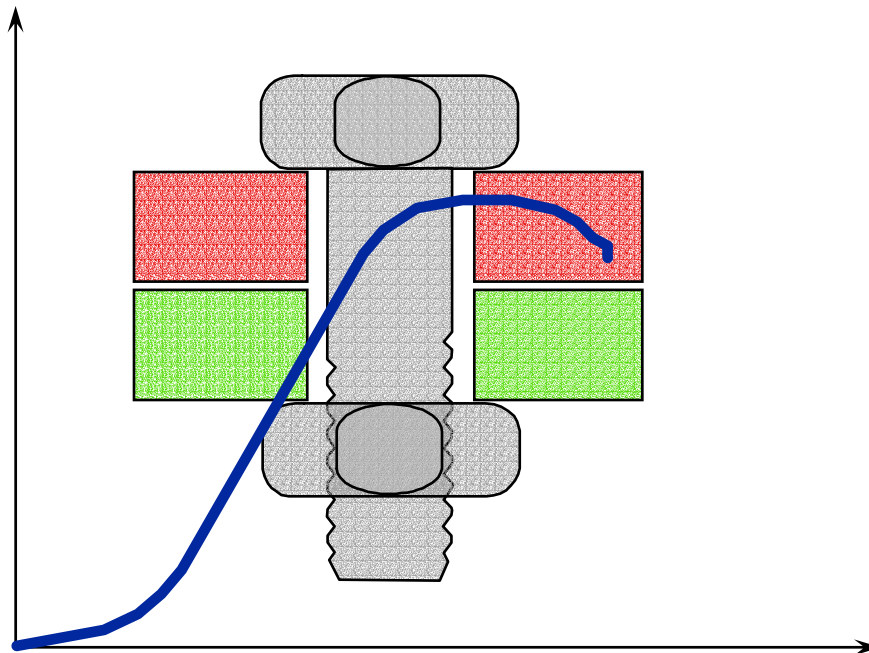
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Affects Tool selection

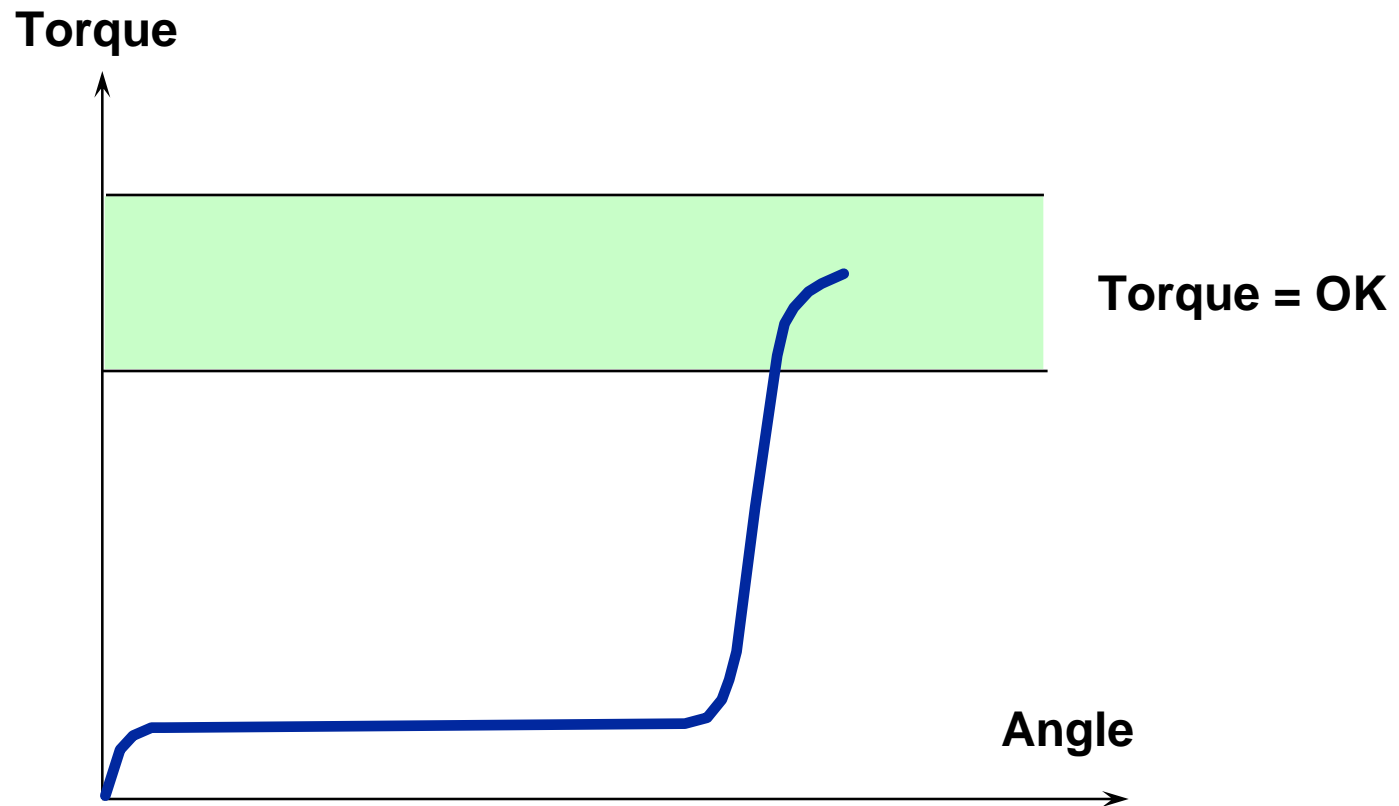
- Rundown speed
- Heat
- Detection of normal joint



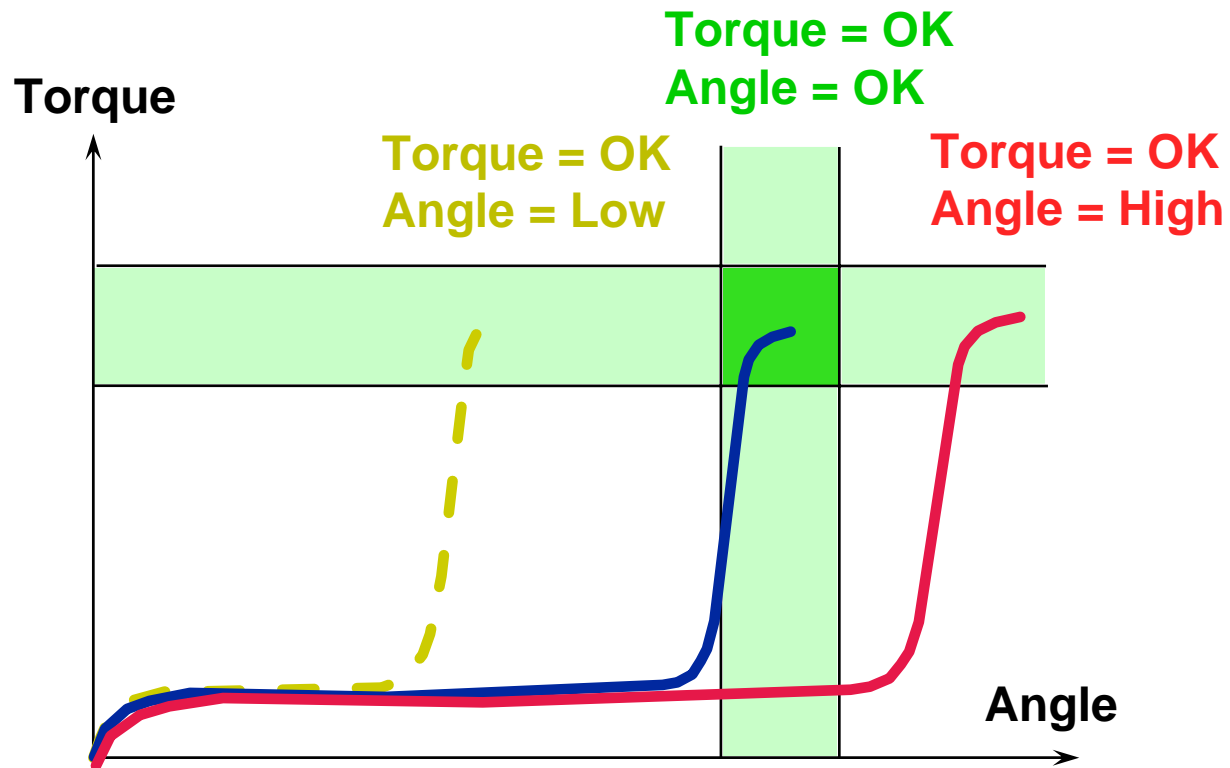
# Tightening Strategies



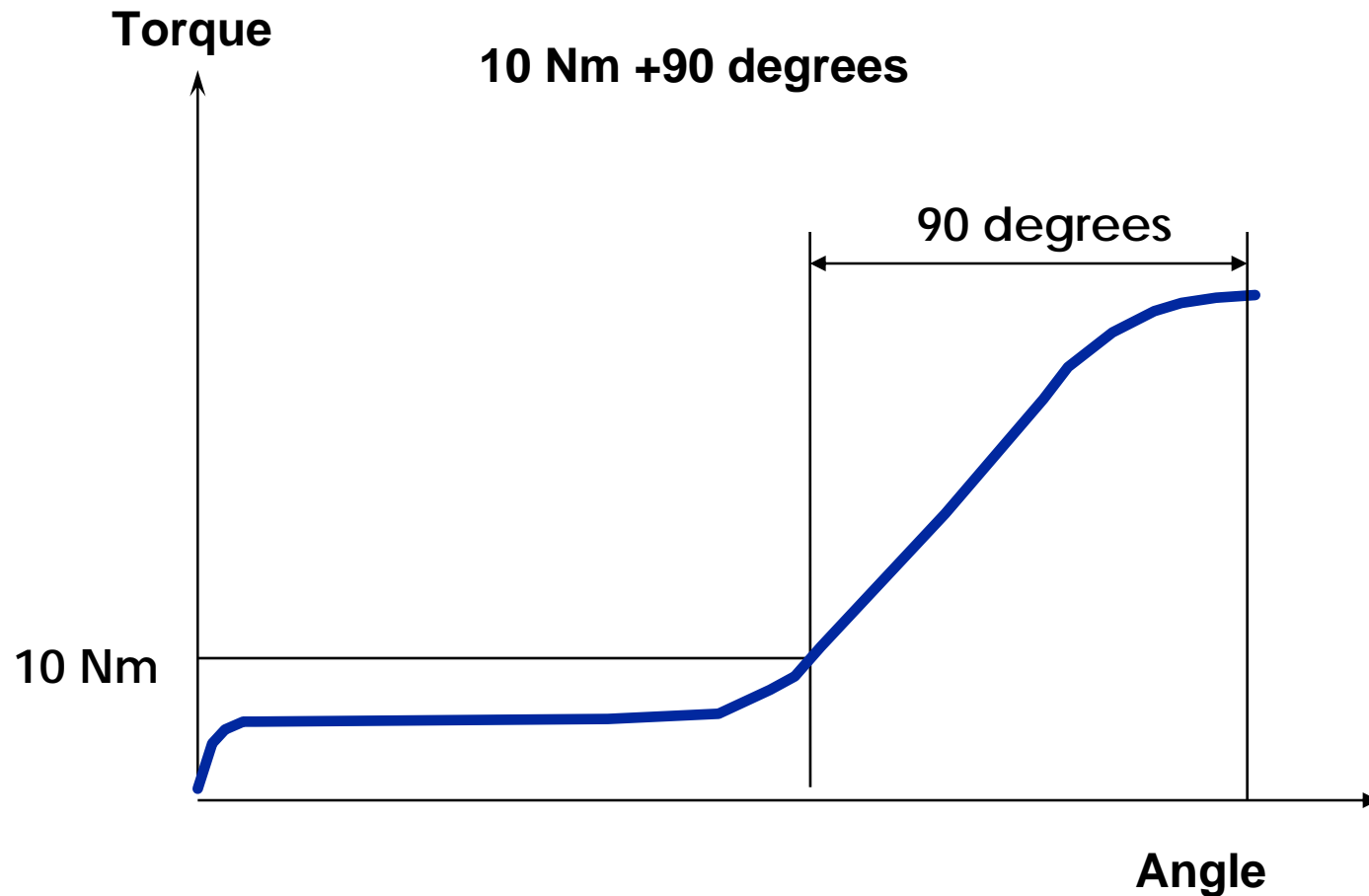
# Torque Control



# Torque + Angle Monitoring Detects reject parts

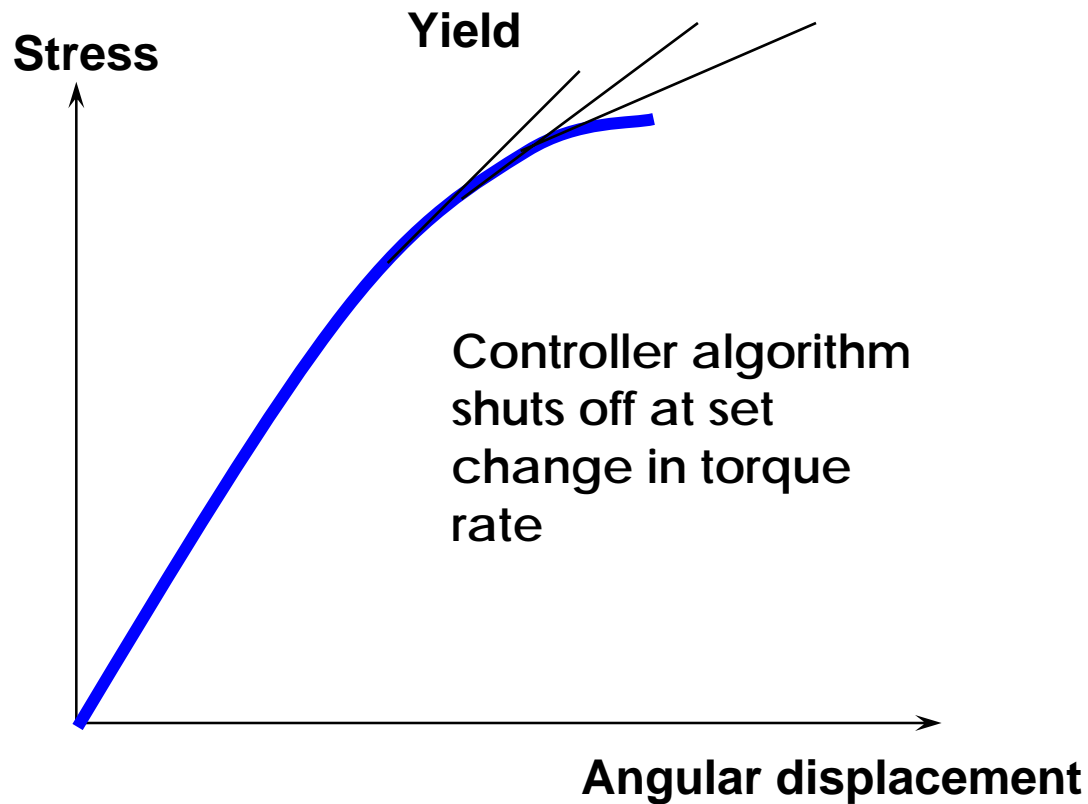


# Torque + Angle Control Increases clamp force accuracy



# Yield Control

## The best clamp force accuracy





# Tool selection

- Choosing the correct tool is not easy
- There is no one-size fits all solution
- Productivity, ergonomics and quality must all be considered



# Choosing the right tools for the job



# Technical Capability Index

	Shut off Pneumatic	Pulse tool + Controller	DC Non Transdxr	DC Transdxr
Accuracy	+/- 12.5 %	+/- 15%	+/- 10 %	+/- 5 %
Reaction support required	7Nm+	NO	7Nm+	7Nm+
Operator feedback	No	Yes	Yes	Yes
Torque settings	1	Yes	6	15
Batch counting	No	Yes	Yes	Yes
Line control	No	Yes	Yes	Yes
Green window (in limits)	No	Yes	Yes	Yes
Angle counting	No	Yes	Yes	Yes
Complex fastening	No	No	No	Yes
Statistics	No	No	No	Yes
Traceability	No	No	No	Yes
Data transfer	No	Status only	Status only	Yes

# Motor Vehicle Industry Issues



**Traceability**



# New legislative demands;

## US legislation – The TREAD Act



National Highway Traffic Safety Administration  
United States Department of Transportation

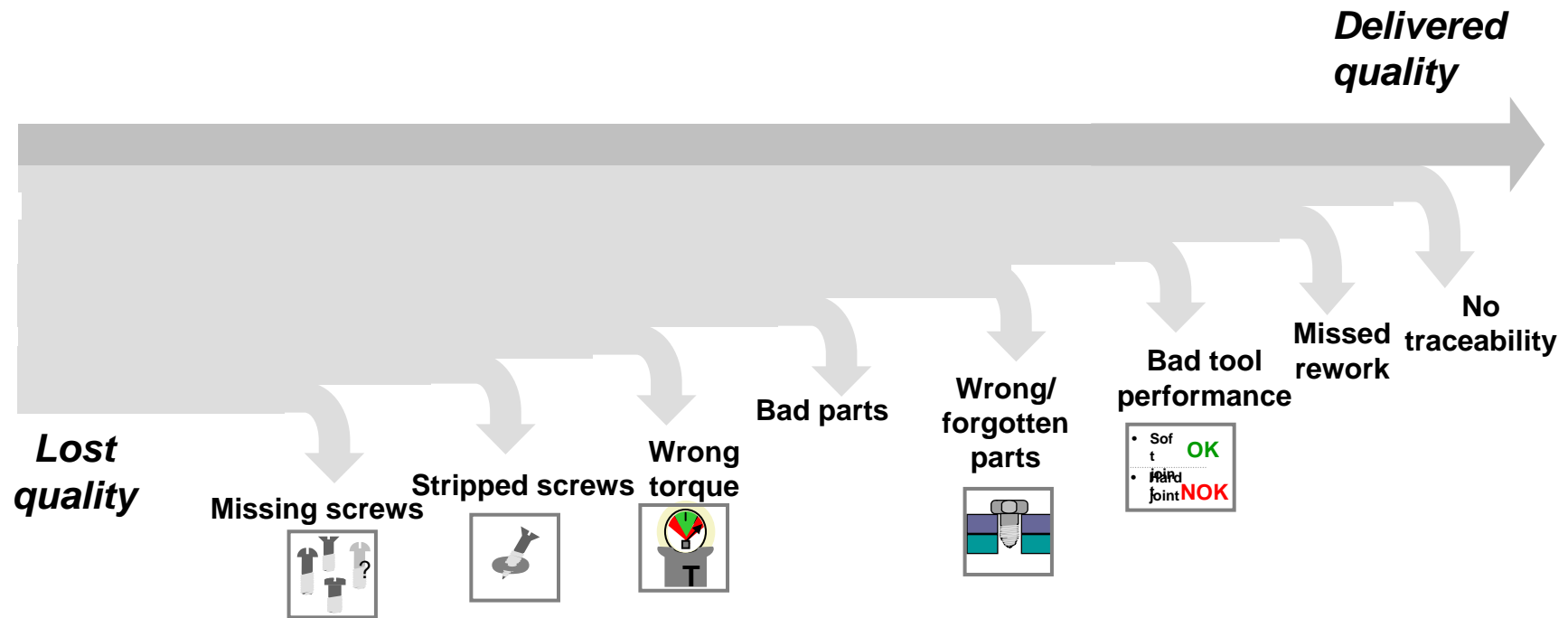
- The TREAD Act applies to manufacturers in and exporters to the US.
- Reaction to the Firestone tyre/Ford Explorer accidents
- It is valid for vehicle, bus, truck & motor cycle manufacturers & suppliers
- Must report any non compliance or defect in 24 categories (airbag, steering, powertrain, etc) within 5 days

ICS 25.140.00; 43.020		VDI-RICHTLINIEN		Juli 1999 July 1999
VEREIN DEUTSCHER INGENIEURE	Einsatz von Schraubsystemen in der Automobilindustrie	Application of fastening systems in the automotive industry		VDI 2862
				Ausg. deutsch/englisch Issue German/English

# Fool Proofing



# A few general problems occur within the assembly industry





# Five steps to zero fault fastening

*Quality Critical – the vast majority of joints*

**Step 1**  
Torque OK



**Step 2**  
Batch OK



**Step 3**  
Joint OK



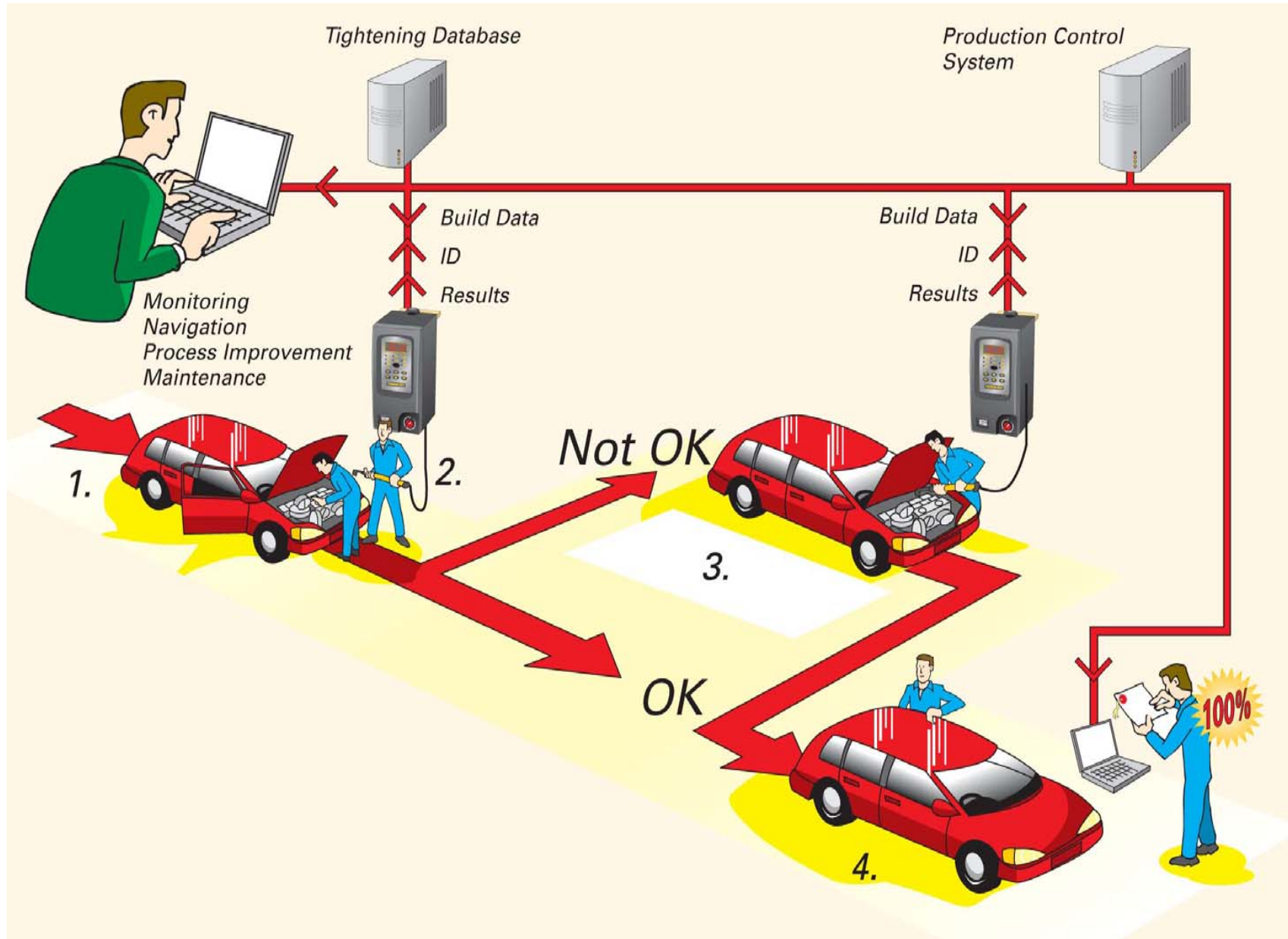
**Step 4**  
Safety critical OK  
(Data collection)



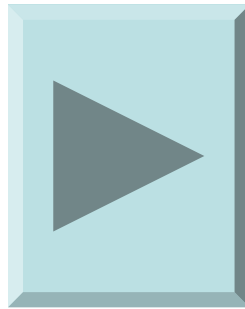
**Step 5**  
Zero fault fastening  
(Controlled rework)



# Step 5. To assure zero fault fastening



# Example BMW Mini Oxford Plant



# Cr6+ Free coatings

- Study in US showed 15% of joints required torque change
- 66% of the changes were so great they needed different equipment
- Lack of knowledge & awareness of possible impact
- Lack of testing
- Passing the responsibility down the supply chain

