AUSTIN POWDER
INTERNATIONAL

1953
2013

60 YEARS
OF INDUSTRIAL DETONATOR
PRODUCTION IN VSETÍN

A SERIES OF PRESS INCIDENTS

2013-12-12

Austin Detonator s.r.o.
Vsetín / Czech Republic

INTRODUCTION

Location:

Austin Detonator plant, Vsetin, Czech Republic

What happened:

Explosion of detonators during pressing

WHEN and WHAT HAPPENED INVOLVED QUANTITY of EXPLOSIVES

What:

Explosion of detonators during pressing

Date of incident	Type of event	Detonators detonated
12 May 2012	explosion	3
9 August 2012	explosion	100
24 August 2012	explosion	3
28 August 2012	near miss	-
18 September 2012	explosion	100

CONSEQUENCES

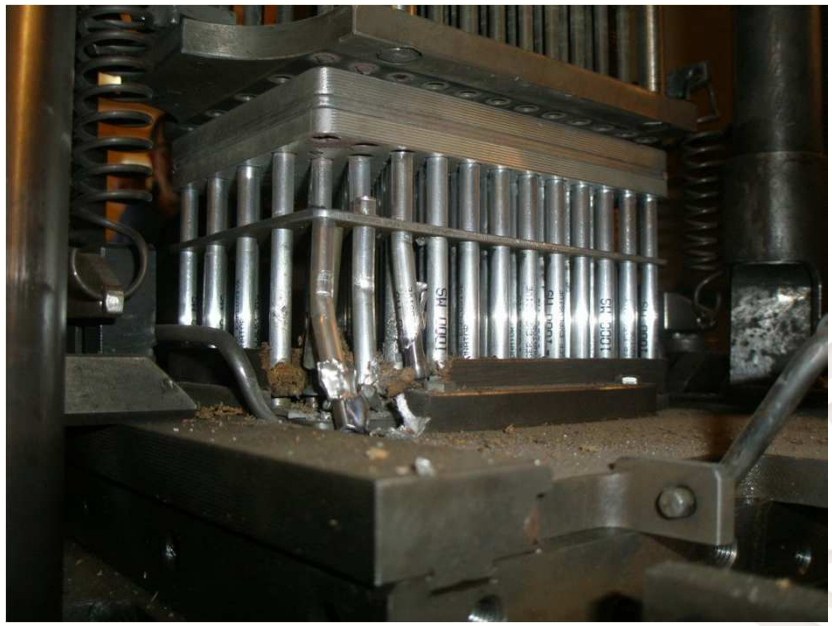
The loading line – out of operation for 3 days

Property damage – about 10.000 EUR / explosion

CONSEQUENCES

X detonators detonated

X = 3



X = 100

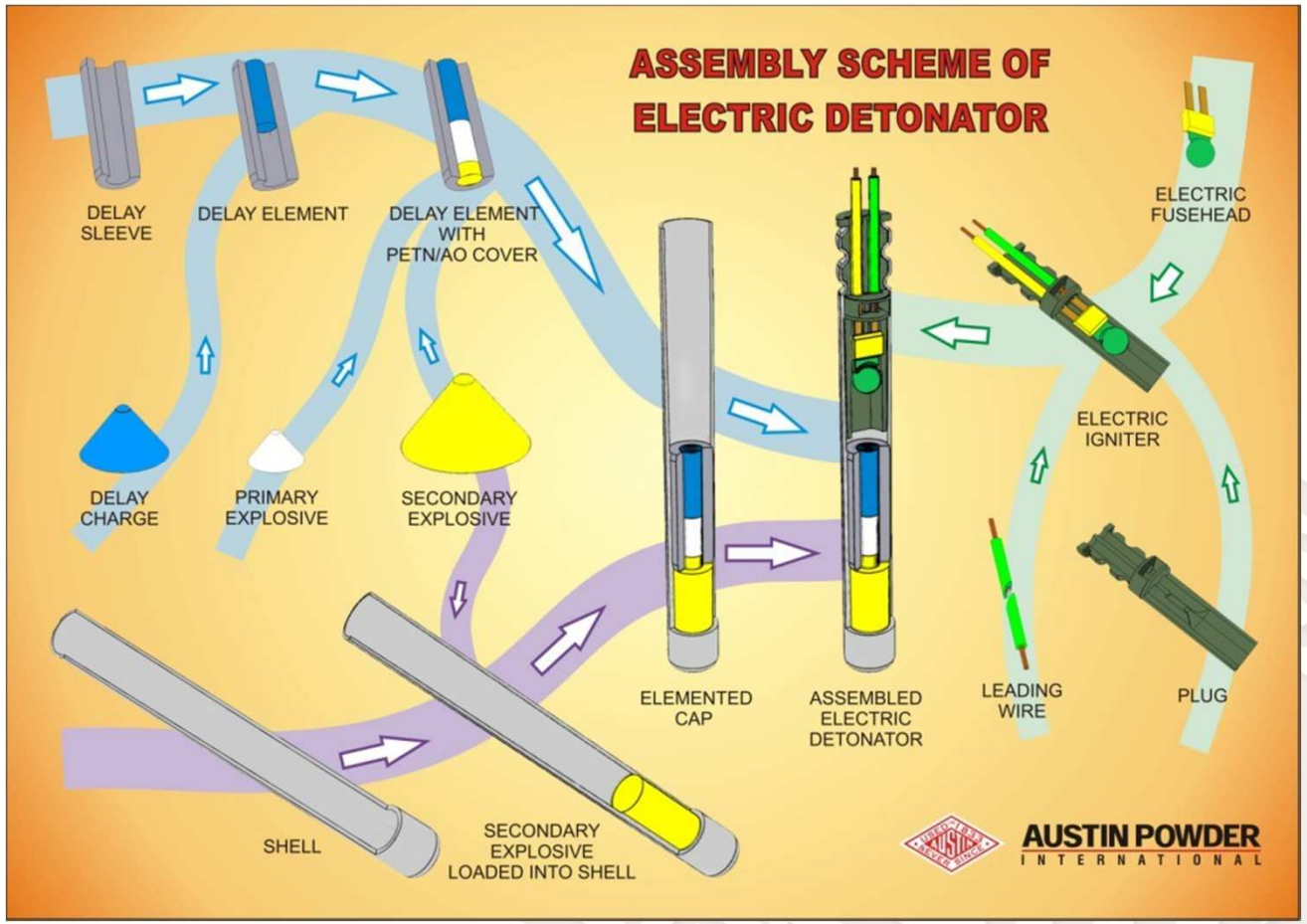
PROCESS OUTLINE

Pressing is a step in detonator manufacture.

It occurs in the Press Building (221).

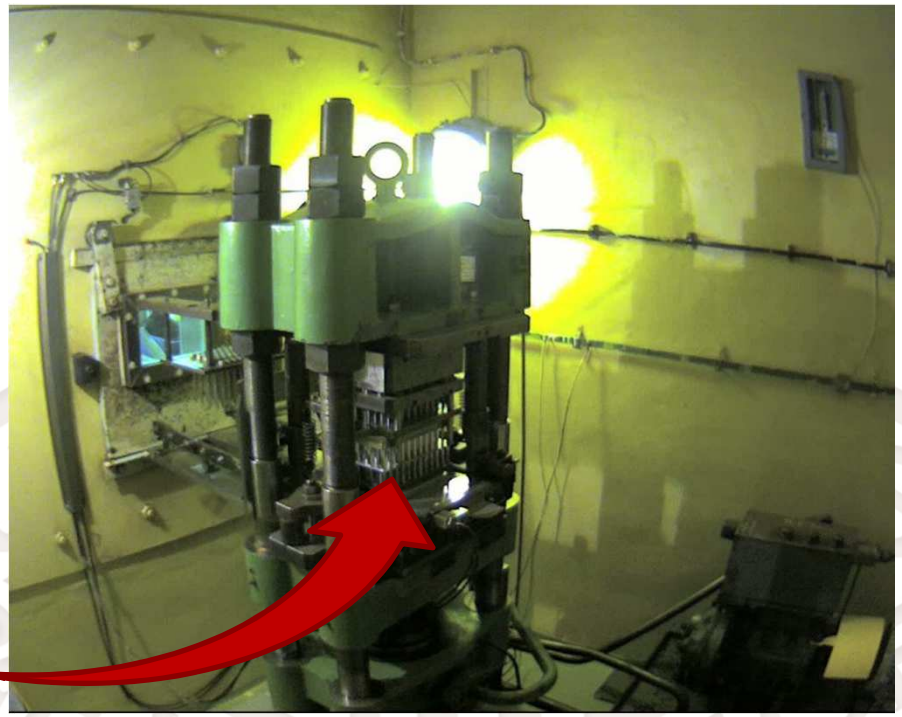
- **The operator puts 100 pieces of iron delay elements (containing the primary charge) and 100 pieces of aluminium shells containing pressed PETN base charge into the loading line plates**
- **Delay elements are pressed into shells in the separate cubicle**
- **Operation pressing is recorded with CCTV**
- **The press equipment is remote-operated**

PROCESS OUTLINE



PROCESS OUTLINE

Delay elements before pressing into shells



INVESTIGATION - FINDINGS

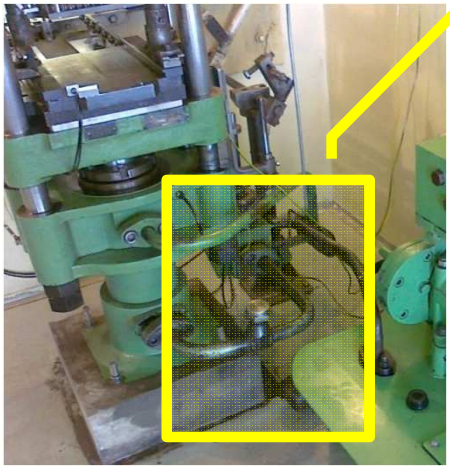
- It was shown from records that the pressing speed was several times higher when explosion occured then in normal operation

- However, this did not explain why all 4 explosions happened to the same shift (No 1) and only at step 18. The same batches of delay elements, shells and explosives had been manufactured in the next three loading lines (basically identical) without problems. Why did explosion not occur to the shift No 2 using the same press and tools?

INVESTIGATION – POSSIBLE CAUSES

- The investigation team checked 27 possible causes (sensitivity of explosives, metal parts, design, human factor, …)
- But all causes were one -by-one ruled out
- We also checked the press equipment several times without success

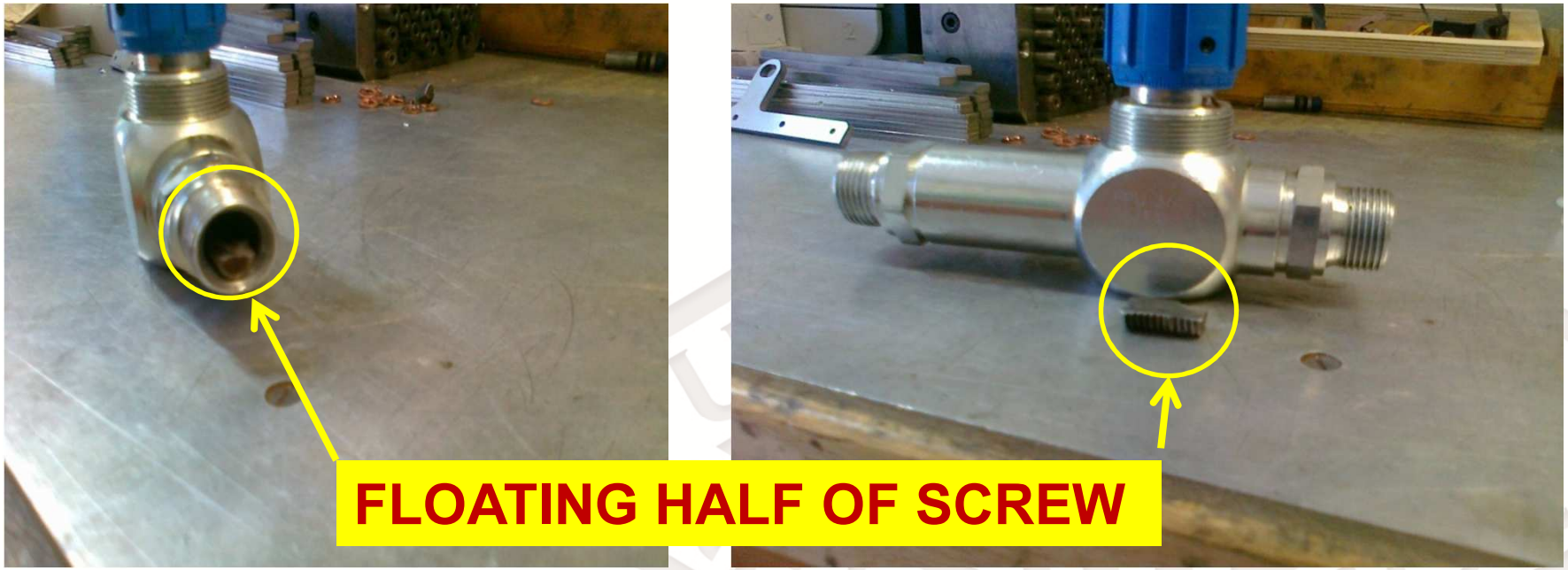
INVESTIGATION – CRUCIAL MOMENTS



- **by coincidence**
  after the first explosion
  we replaced
  the „old design“ valve
  of hydraulic unit to
  the „new design“ **valve**
  to save press time
  during reverse
  running.

INVESTIGATION – CRUCIAL MOMENTS

- Down to hard work we observed after the third explosion that **half of a screw blocked** the „new design“ valve in the hydraulic unit.



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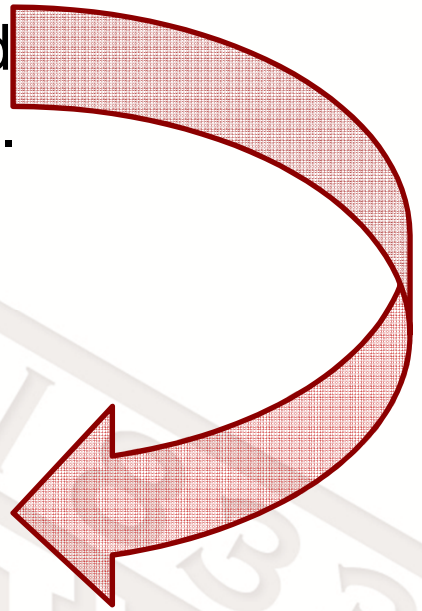
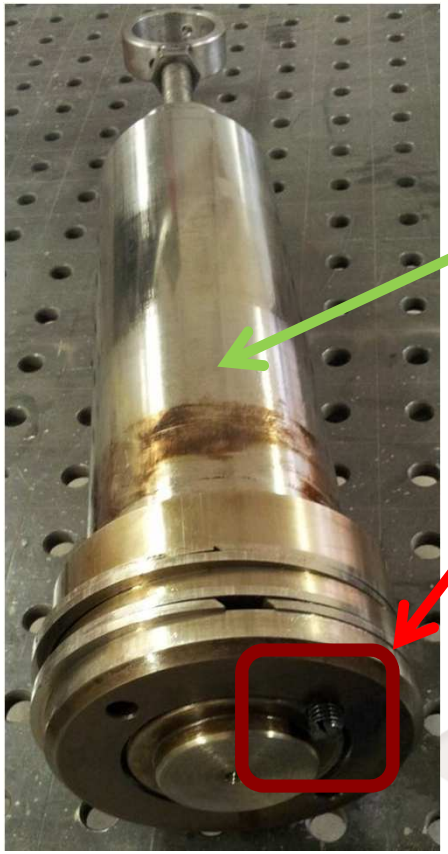


- **3 months after the first explosion we dismantled the „old design“ valve and we found „surprisingly“ inside it the other piece of the screw.**

INVESTIGATION – SCREW
WHERE ARE SCREW FROM?

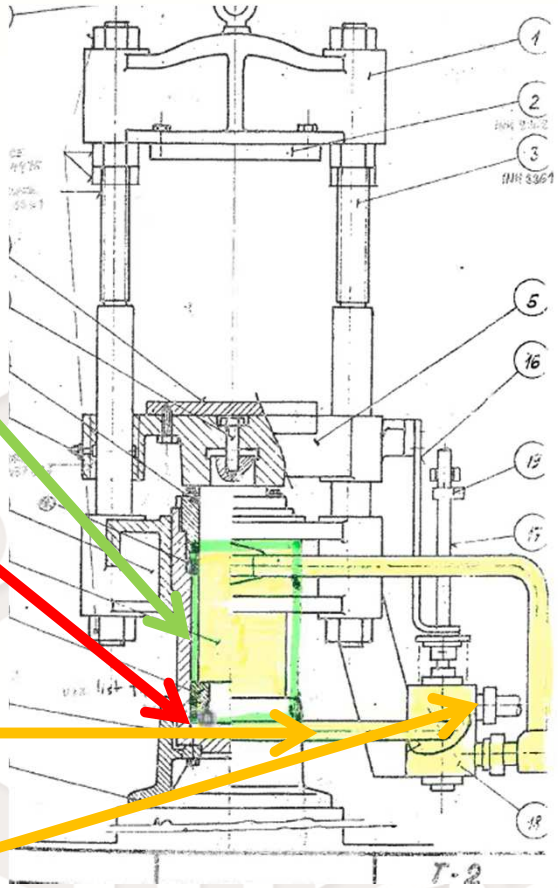


PISTON

SCREW

HYDRAULIC SYSTEM

VALVE



ACTIONS

- **The investigation took almost 4 months and in the meantime we took 20 technical and organization actions.**

- **Explosion stopped once we had:**
  - **removed lost screw,**
  - **reinstalled the old design valve**
  - **slightly widened the inner diameter of shell to reduce friction between shell and delay element.**

SUMMARY

KNOWN

- **- CCTV RECORDS**
- **- REPLACEMENT of VALVE**
- **- DELAY ELEMENT / SHELL FRICTION**

INVOLVED

- **- RAISED SPEED of PRESS EQUIPMENT**
- **- VALVE DESIGN**
- **- 1st SHIFT**
- **- DELAY ELEMENT/SHELL (STEP 18)**

ROOT CAUSE

- **- LOST SCREW**
- **- INNER DIAMETER of SHELL (STEP 18)**

LEARNING

- A screw costing 2 cents can cause damage more then 10.000 EUR
- Always check all possible root causes. Nobody is looking for hidden fault when the equipment has been maintained and reliably operated more than 40 years
- Use CCTV to monitor operations where-ever it is possible. It costs little money and you could recieve priceless information about the operation

USED IN 1833 AUSTIN & EVER SINCE

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