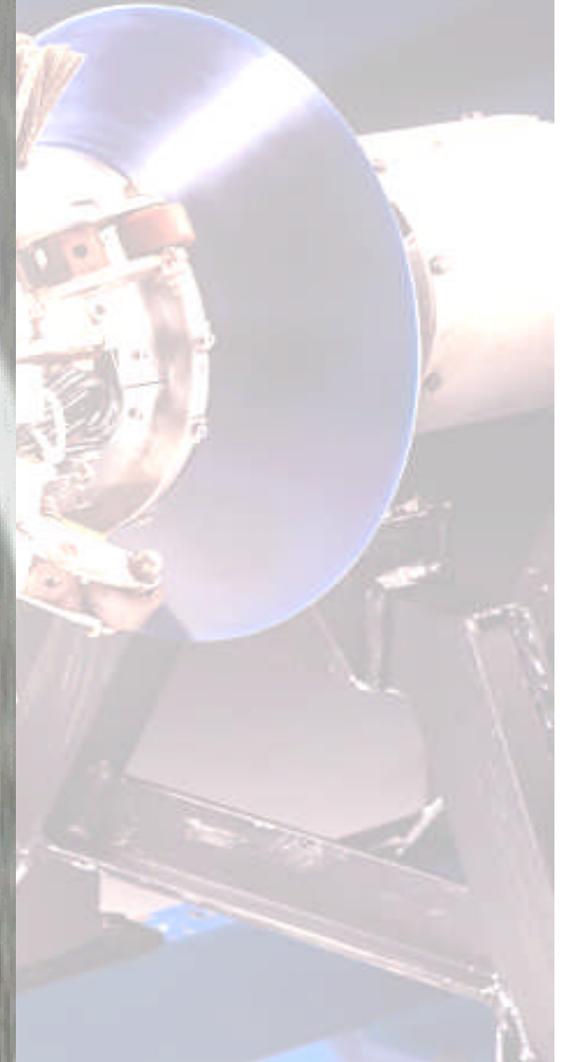
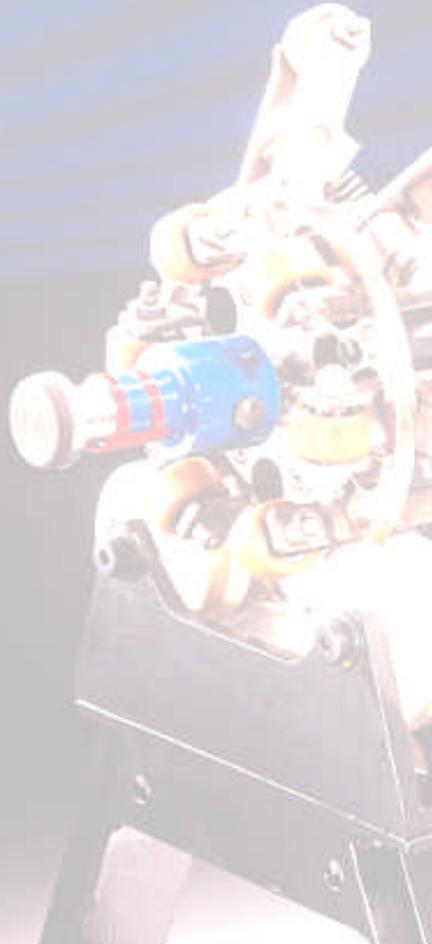


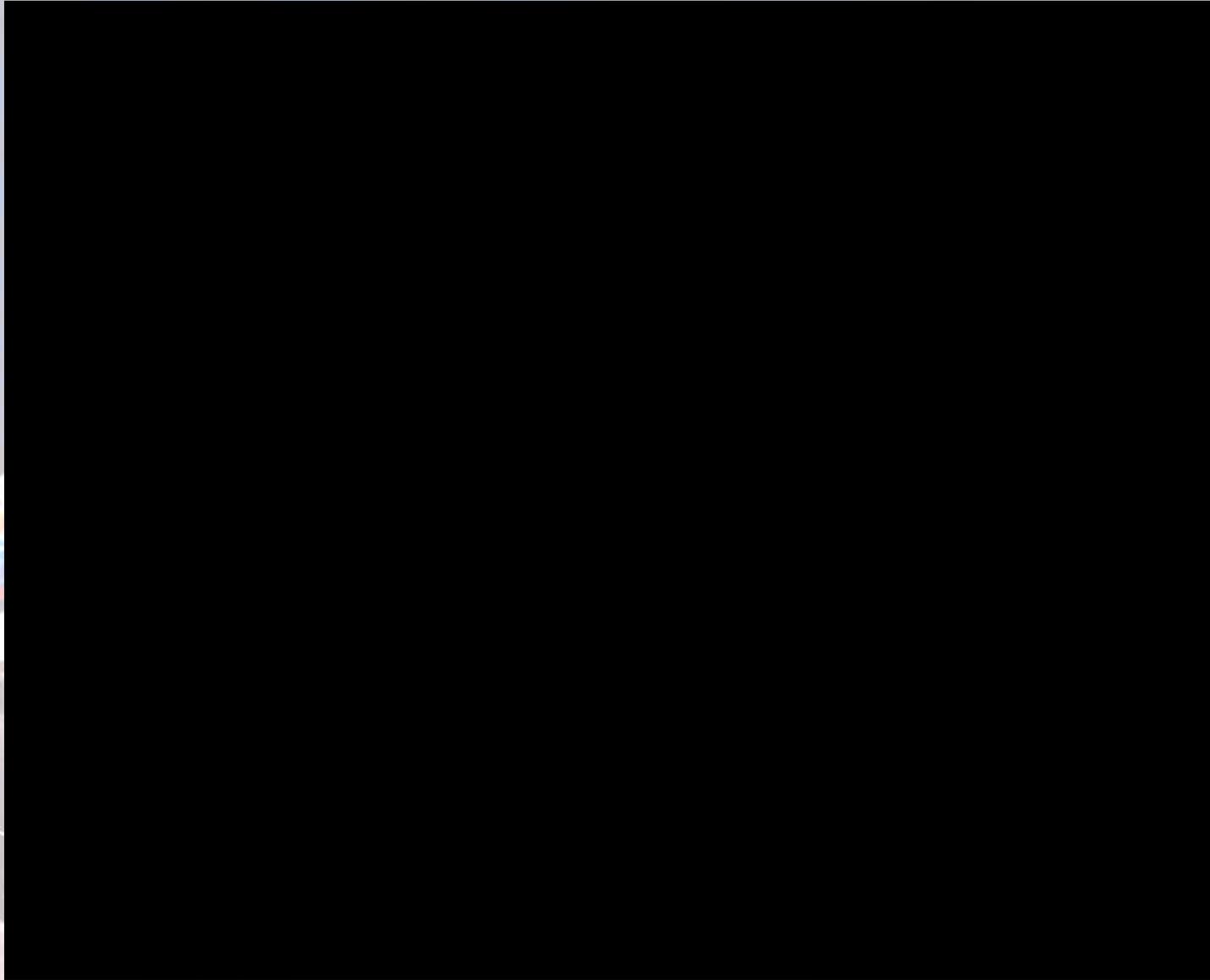


Pigging





**For those who may not be familiar
with “running a pig” . . .**





History of Intelligent Pigging



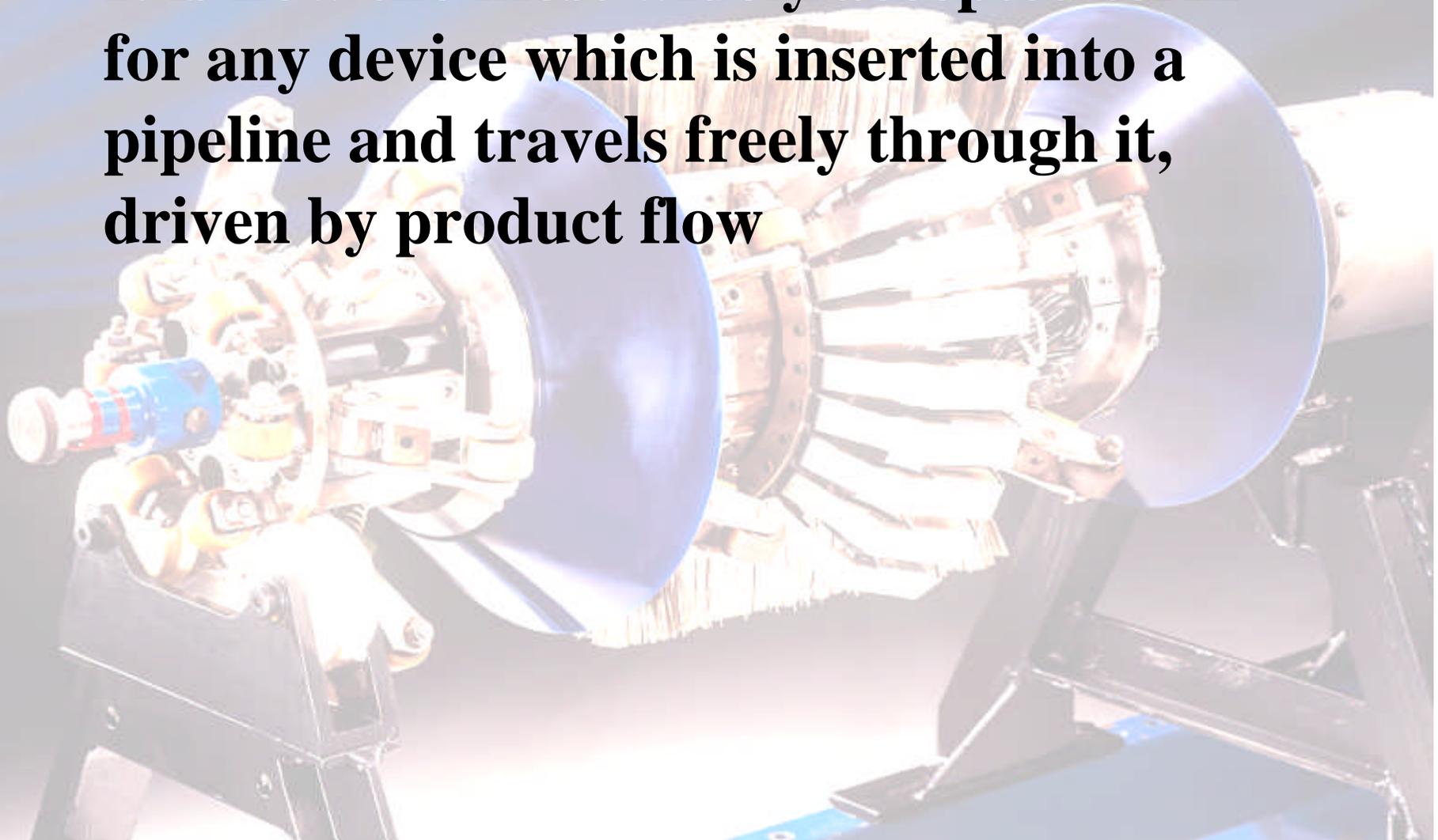


History of Intelligent Pigging



PIG

- It is now the most widely accepted term for any device which is inserted into a pipeline and travels freely through it, driven by product flow



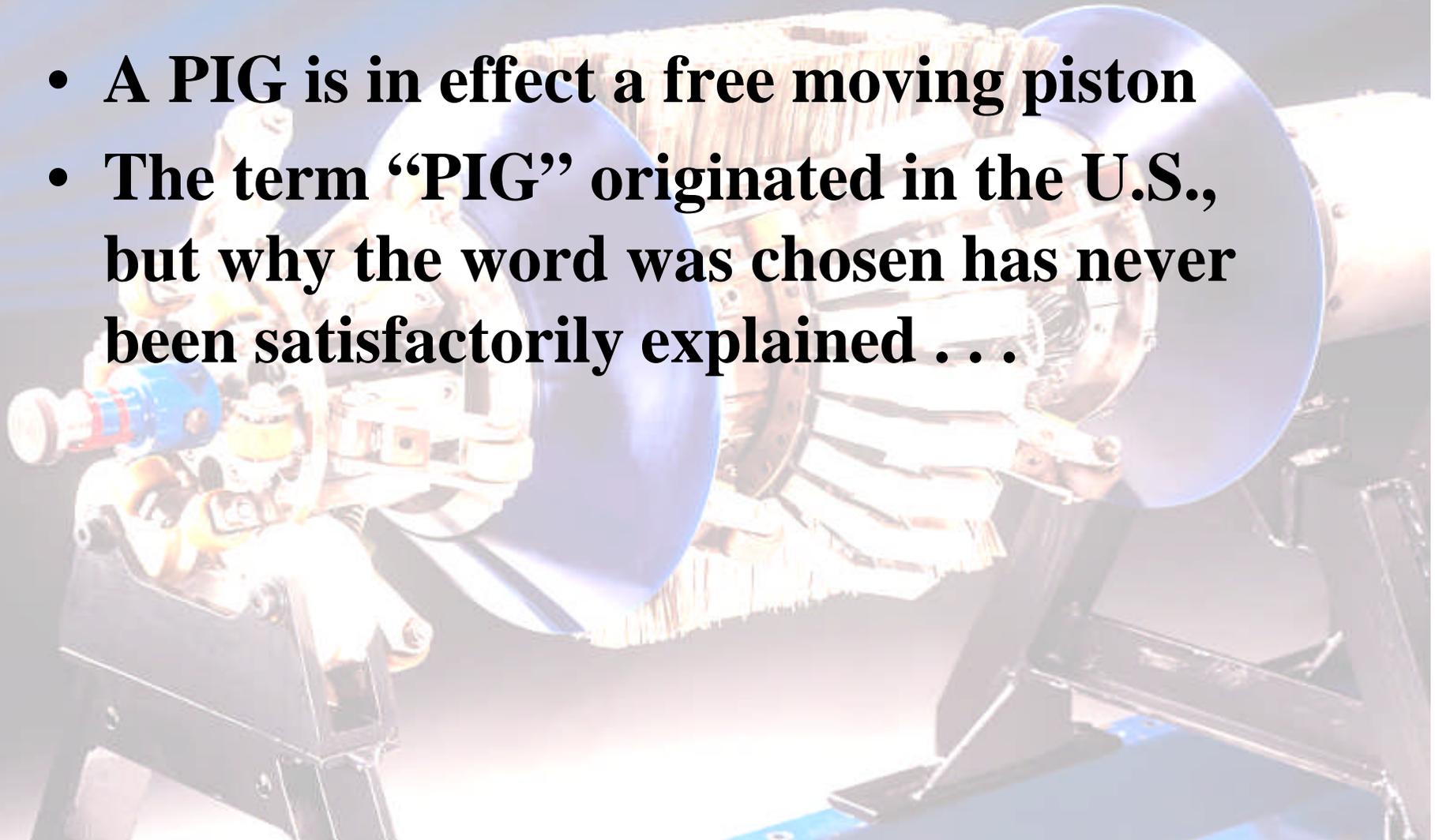


History of Intelligent Pigging



PIG

- A PIG is in effect a free moving piston
- The term “PIG” originated in the U.S., but why the word was chosen has never been satisfactorily explained . . .



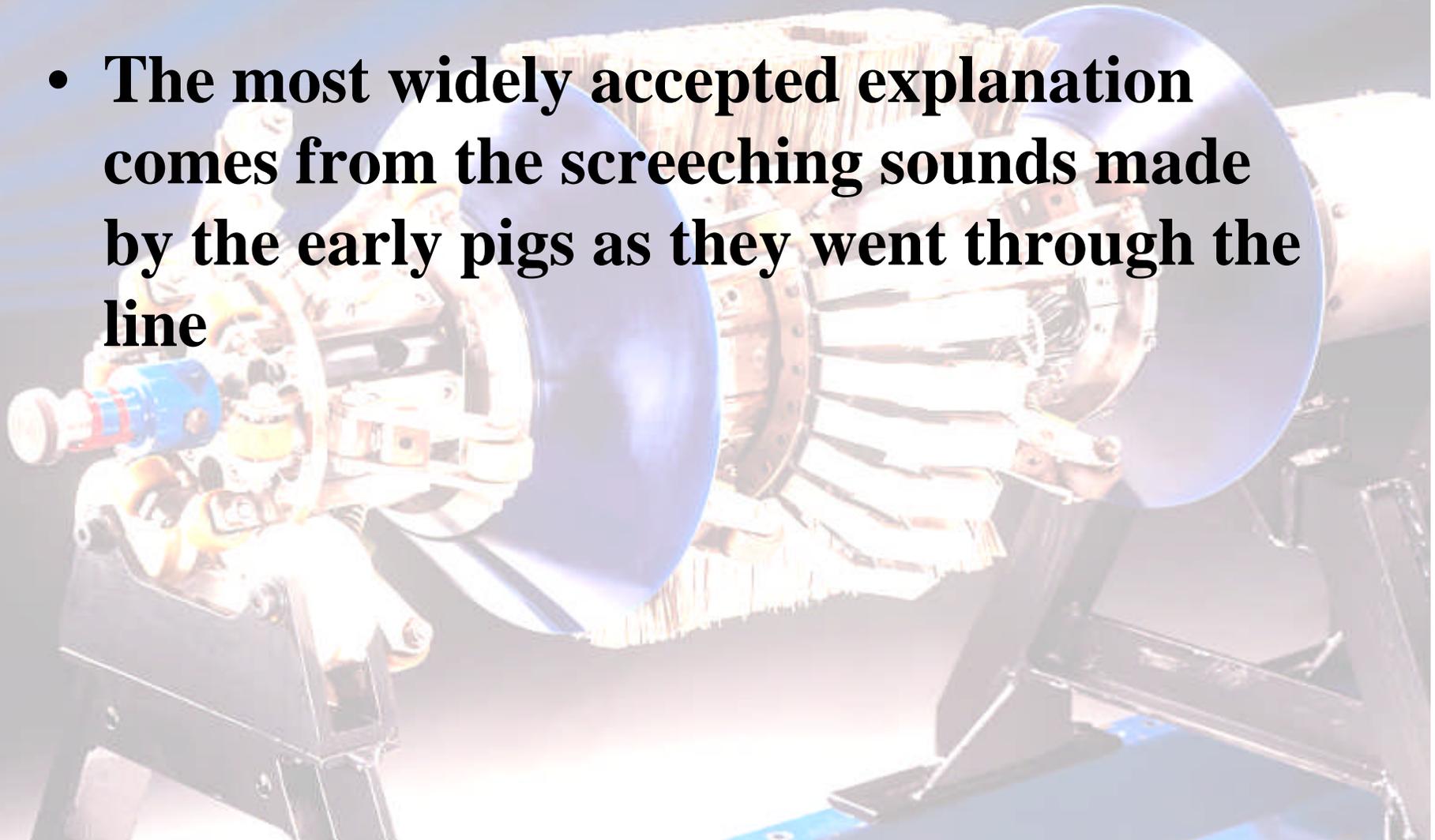


History of Intelligent Pigging



PIG

- **The most widely accepted explanation comes from the screeching sounds made by the early pigs as they went through the line**





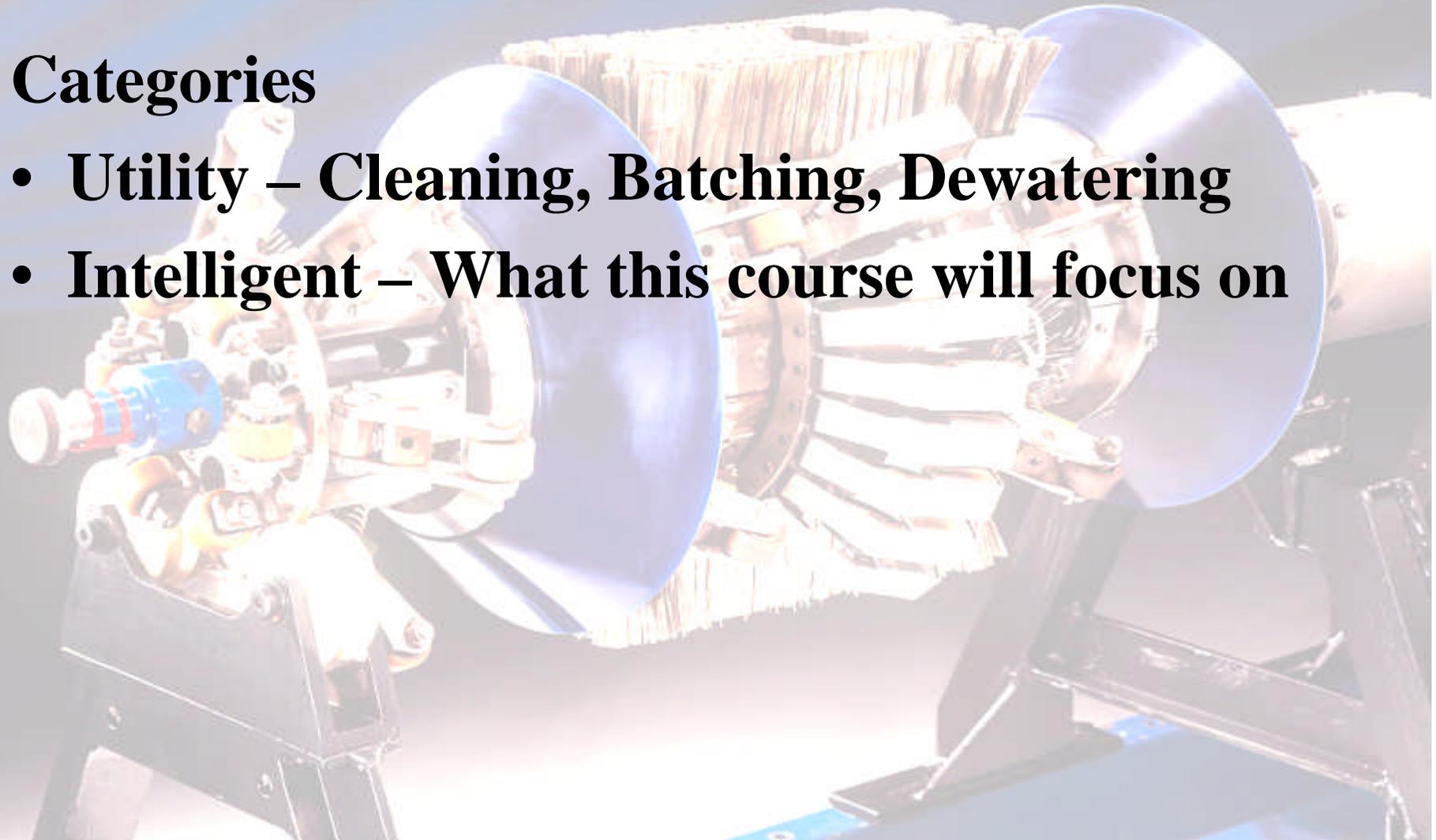
History of Intelligent Pigging



PIG

Categories

- **Utility – Cleaning, Batching, Dewatering**
- **Intelligent – What this course will focus on**



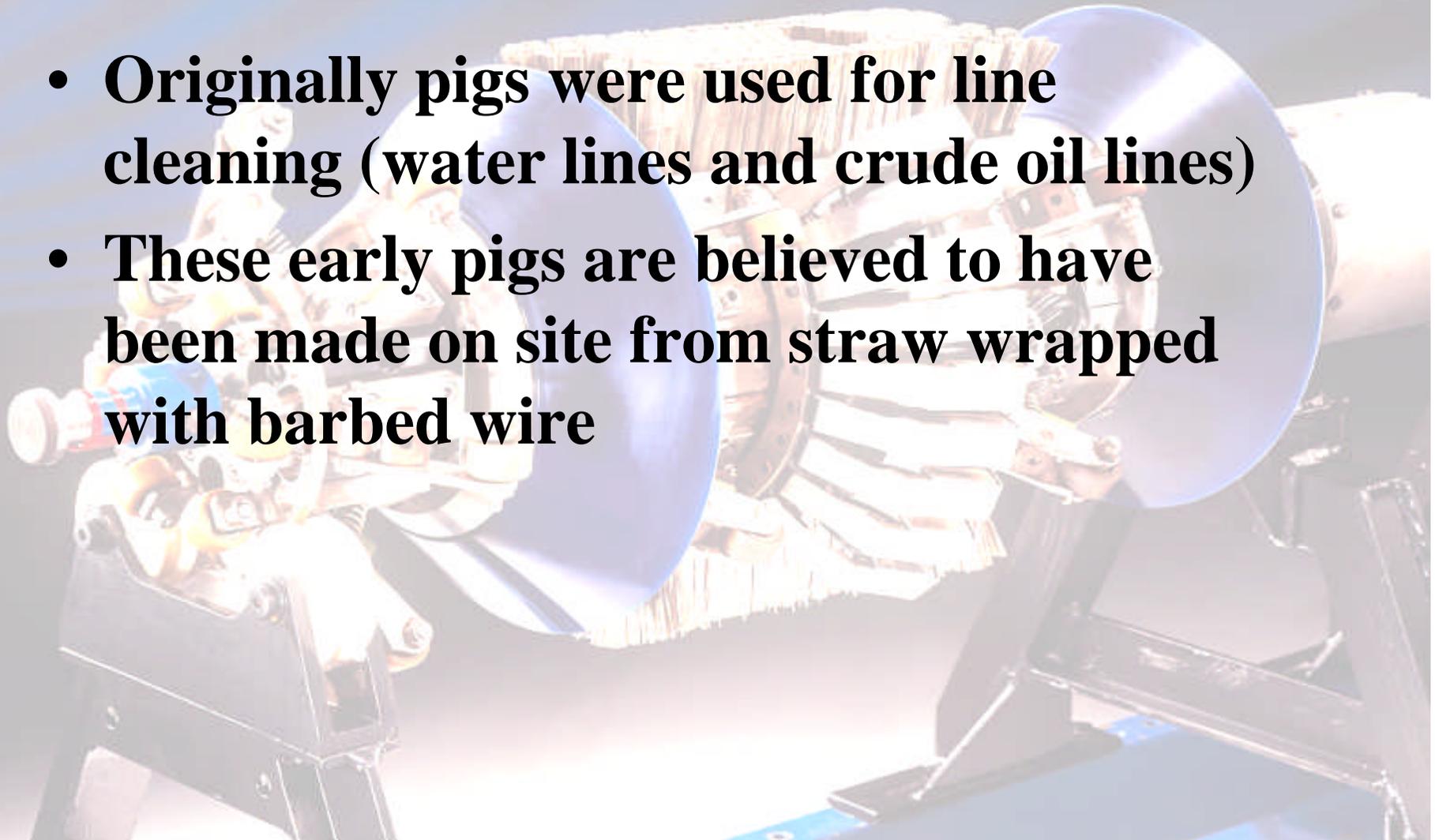


History of Intelligent Pigging



Early PIG – Utility

- **Originally pigs were used for line cleaning (water lines and crude oil lines)**
- **These early pigs are believed to have been made on site from straw wrapped with barbed wire**



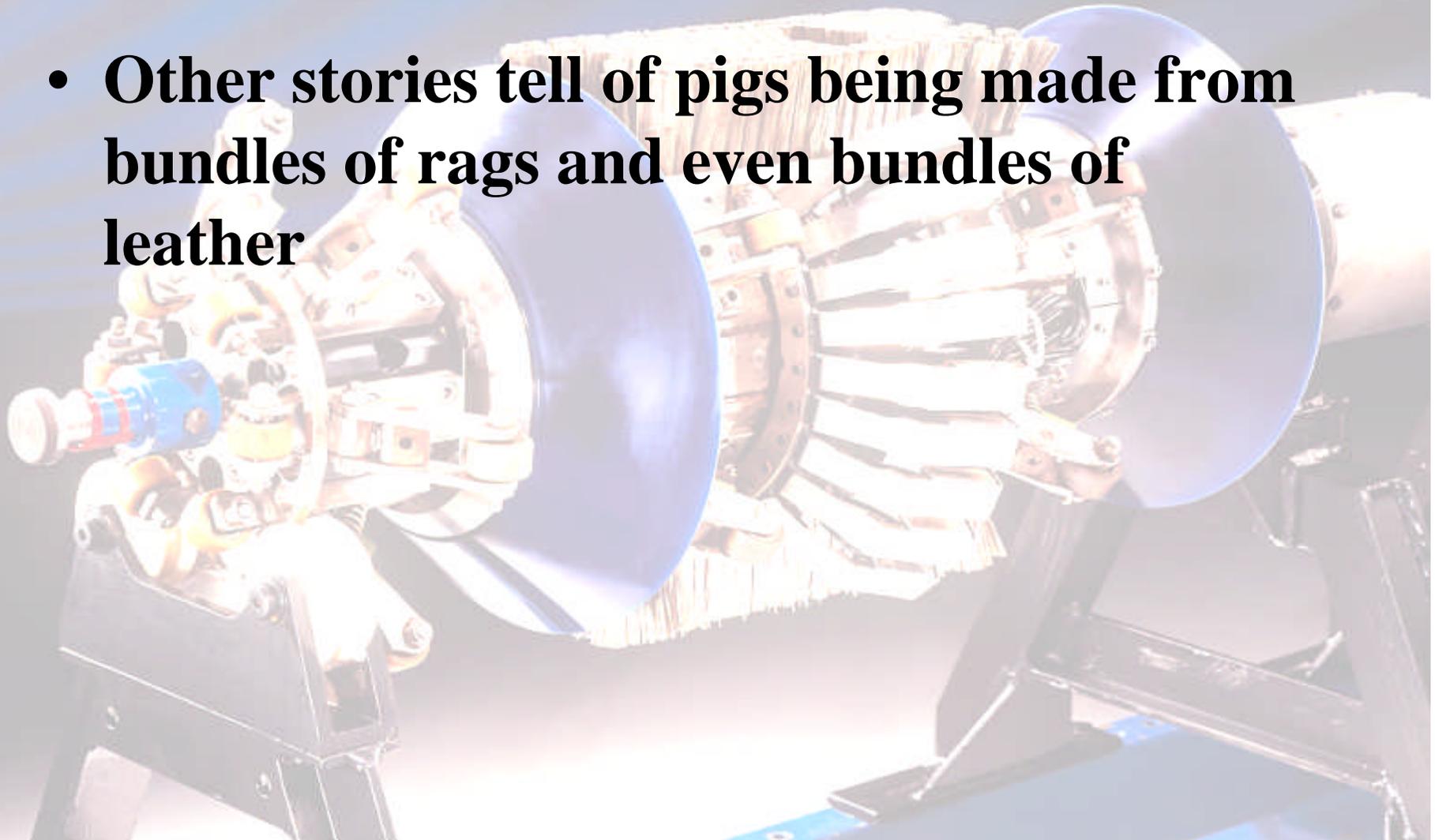


History of Intelligent Pigging



Early PIG – Utility

- **Other stories tell of pigs being made from bundles of rags and even bundles of leather**



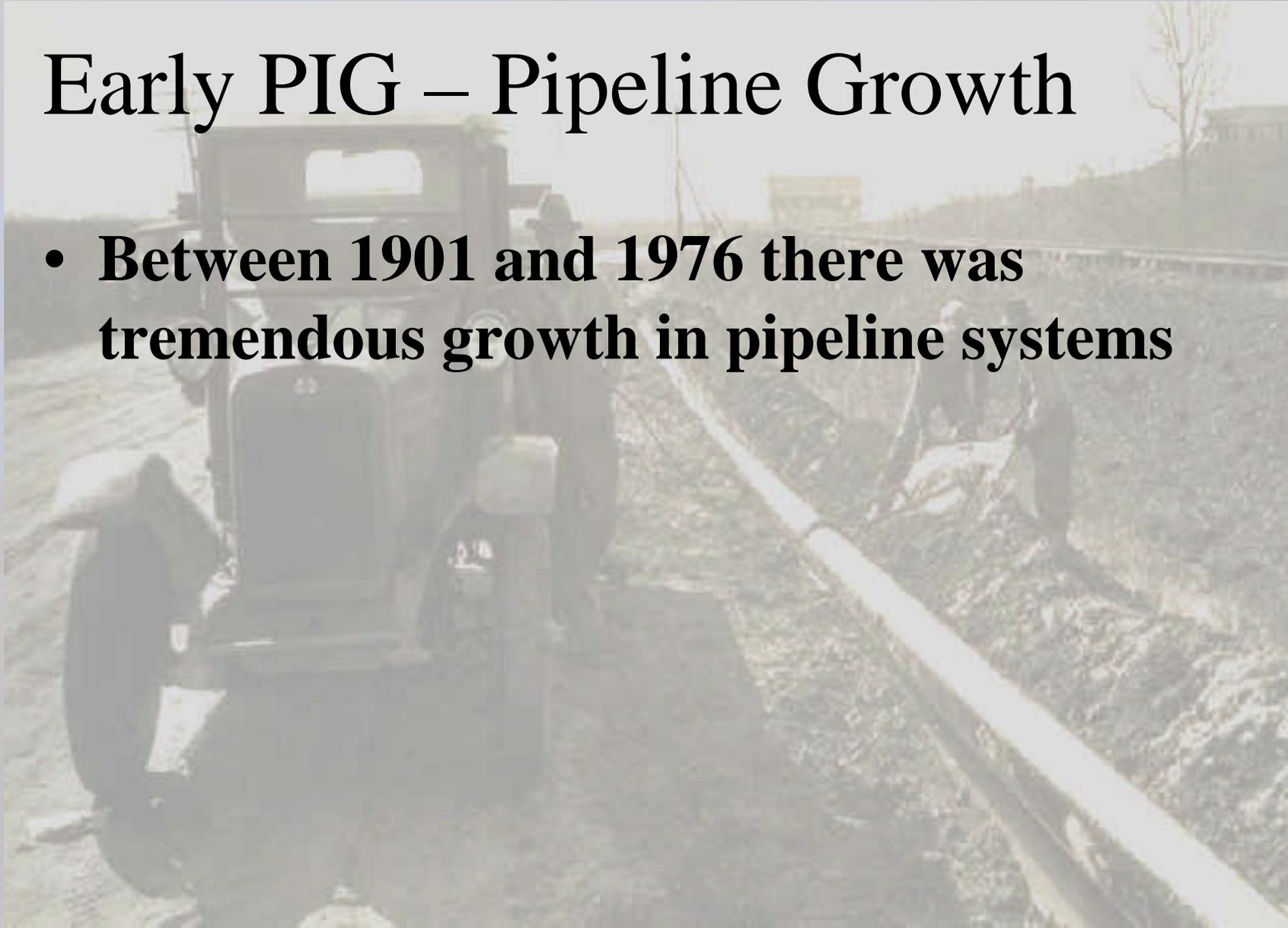


History of Intelligent Pigging



Early PIG – Pipeline Growth

- **Between 1901 and 1976 there was tremendous growth in pipeline systems**



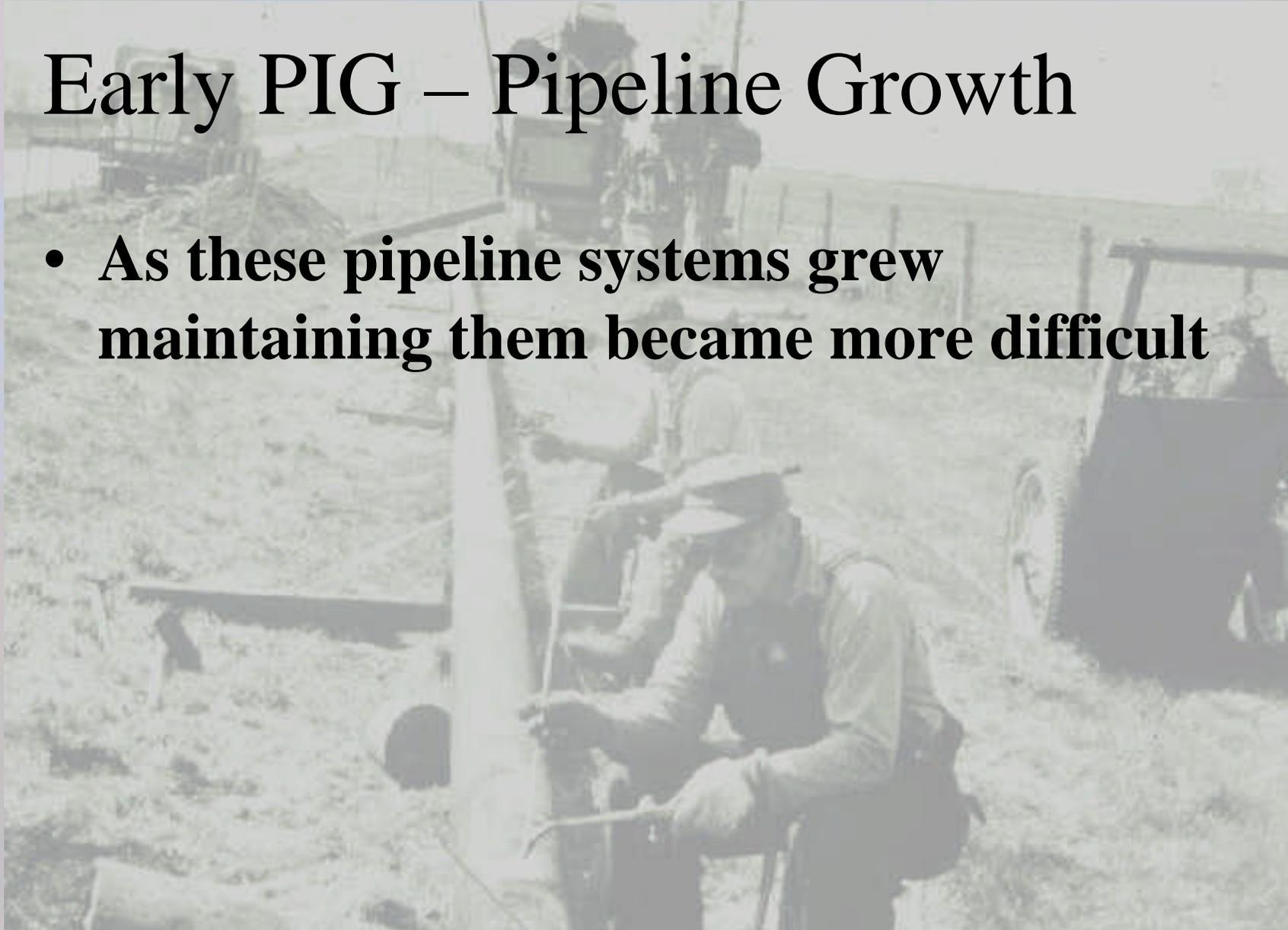


History of Intelligent Pigging



Early PIG – Pipeline Growth

- **As these pipeline systems grew maintaining them became more difficult**





History of Intelligent Pigging



Early PIG – Early Inspection

Inspection methods before ILI surveys

- **Leak Record**
- **Visual Inspection**
- **Hydrostatic Test**
- **Close Interval Survey**





History of Intelligent Pigging



Early PIG – Intelligent

Question: When is a PIG intelligent?

Answer: When it . . .

- **measures and records information used to assess pipeline integrity**
- **performs nondestructive assessment of pipeline defects**
- **Performs an internal assessment of the pipe bore diameter**

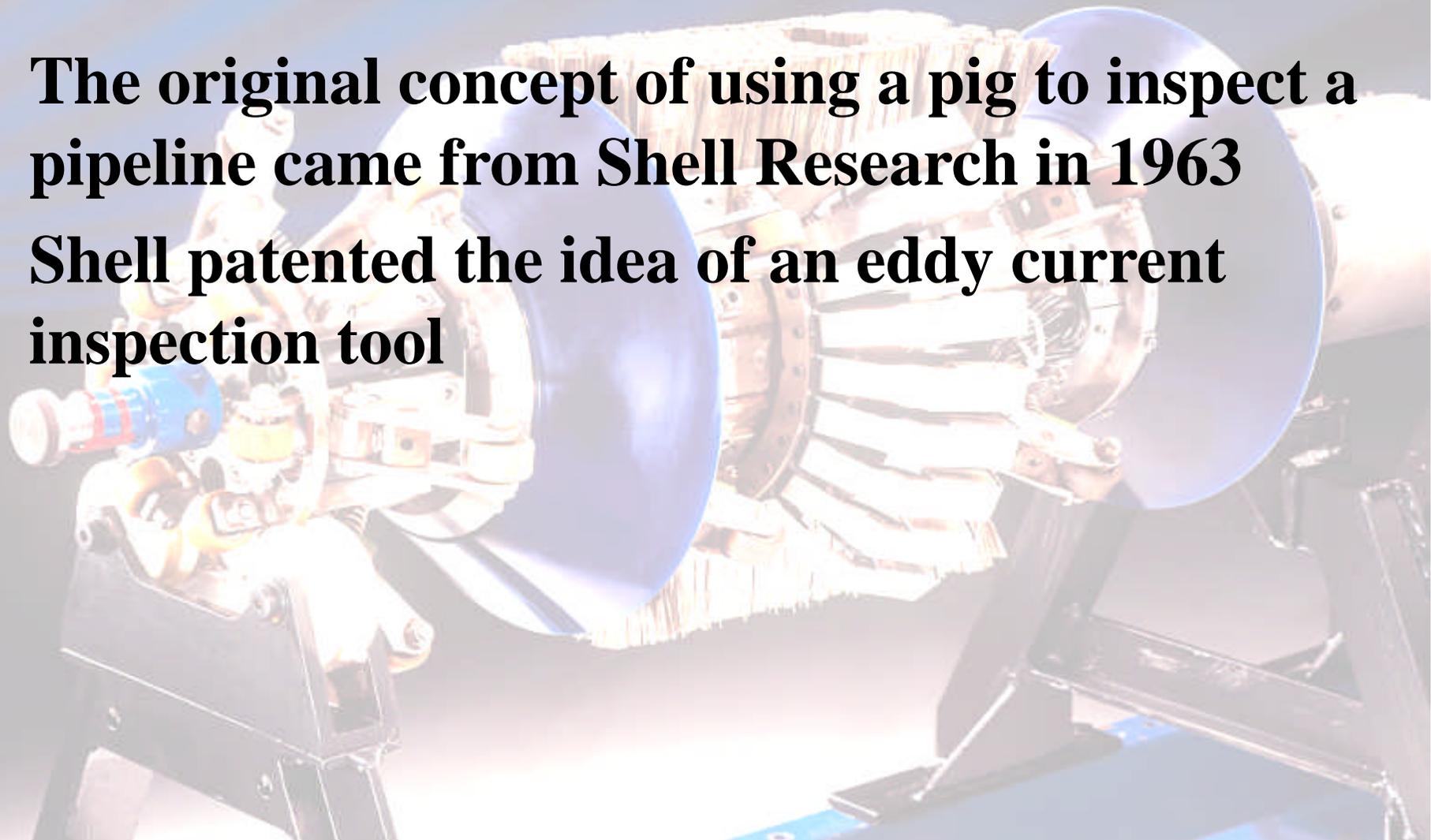


History of Intelligent Pigging



Early PIG – First Inspection Tool

- **The original concept of using a pig to inspect a pipeline came from Shell Research in 1963**
- **Shell patented the idea of an eddy current inspection tool**





History of Intelligent Pigging



Early PIG – First Inspection Tool

- **Tuboscope bought the patent and changed the design to an MFL (magnetic flux leakage) system based on their existing drill pipe inspection techniques**
- **Out of this research the first MFL tool was created-it was called the 90° Tool**



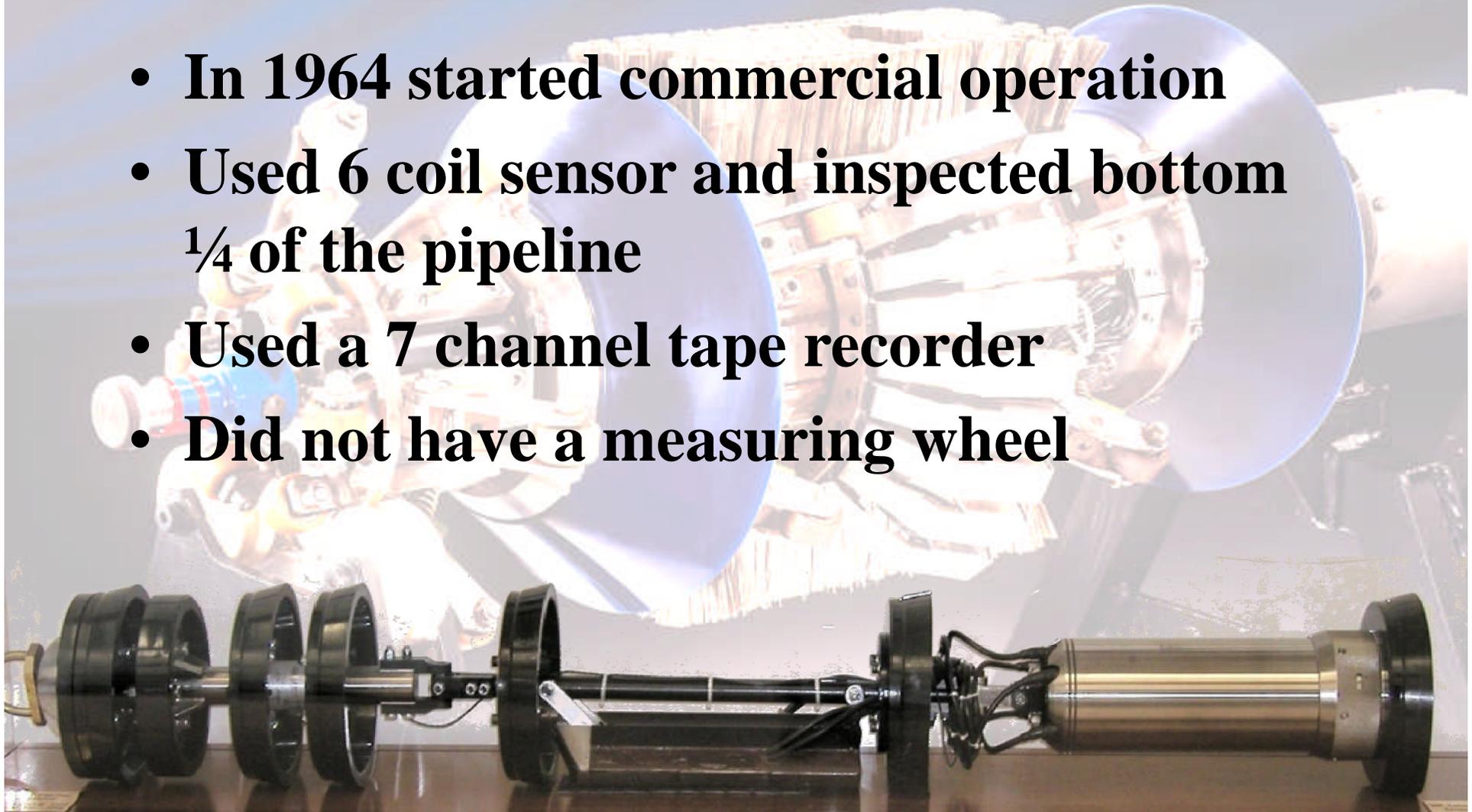


History of Intelligent Pigging



Early PIG – 90° Tool

- **In 1964 started commercial operation**
- **Used 6 coil sensor and inspected bottom ¼ of the pipeline**
- **Used a 7 channel tape recorder**
- **Did not have a measuring wheel**



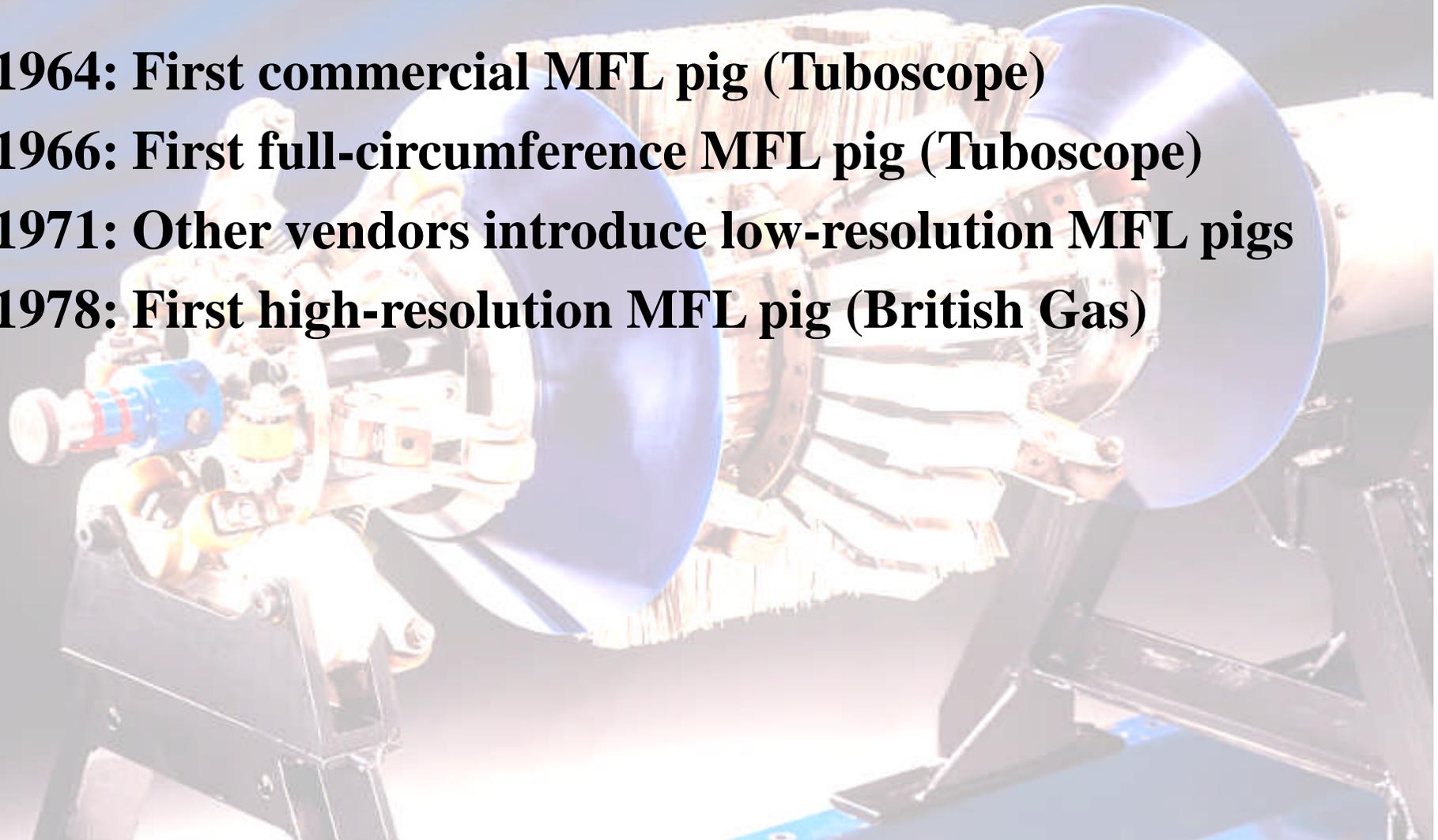


History of Intelligent Pigging



Timeline

- **1964: First commercial MFL pig (Tuboscope)**
- **1966: First full-circumference MFL pig (Tuboscope)**
- **1971: Other vendors introduce low-resolution MFL pigs**
- **1978: First high-resolution MFL pig (British Gas)**



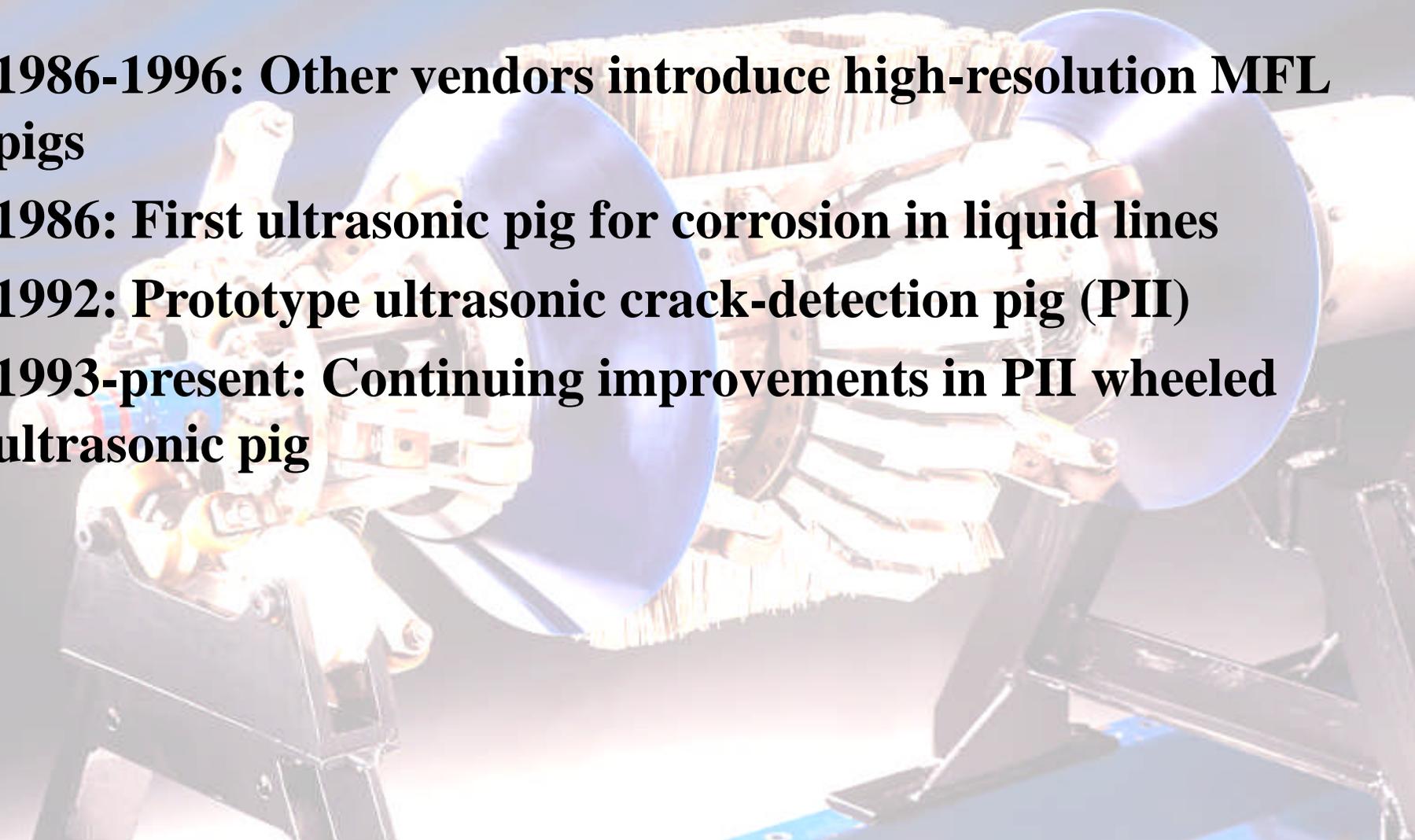


History of Intelligent Pigging



Timeline

- **1986-1996: Other vendors introduce high-resolution MFL pigs**
- **1986: First ultrasonic pig for corrosion in liquid lines**
- **1992: Prototype ultrasonic crack-detection pig (PII)**
- **1993-present: Continuing improvements in PII wheeled ultrasonic pig**



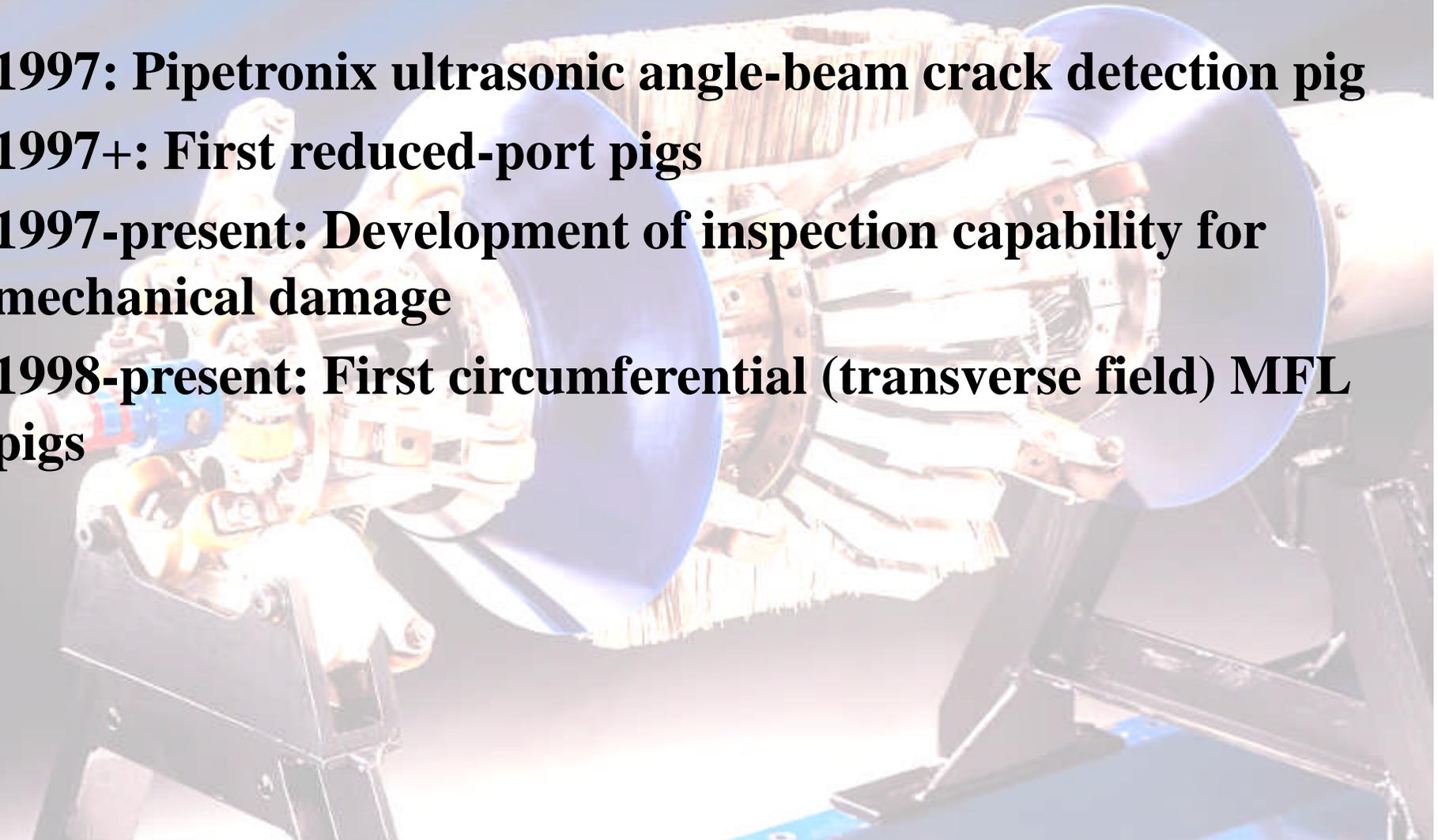


History of Intelligent Pigging



Timeline

- **1997: Pipetronix ultrasonic angle-beam crack detection pig**
- **1997+: First reduced-port pigs**
- **1997-present: Development of inspection capability for mechanical damage**
- **1998-present: First circumferential (transverse field) MFL pigs**





History of Intelligent Pigging



More History?

- **GTI Handbook for Using Pipeline Industry Research**
 - Referred to as the research yellow pages
 - Near completion
 - Very readable history of pigging
 - 70 references - with most significant summarized

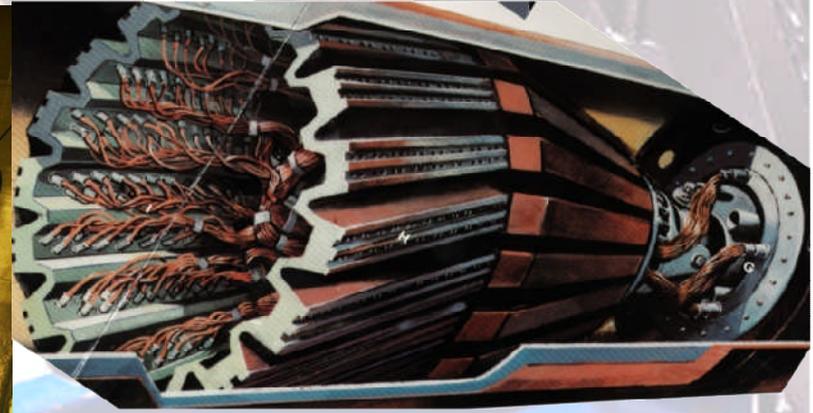
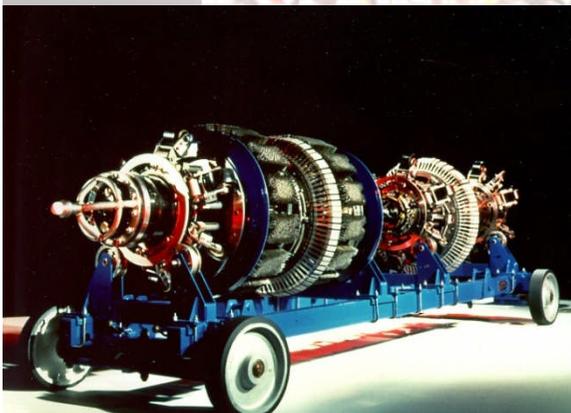


History of Intelligent Pigging



Types of Intelligent or Smart Pigs

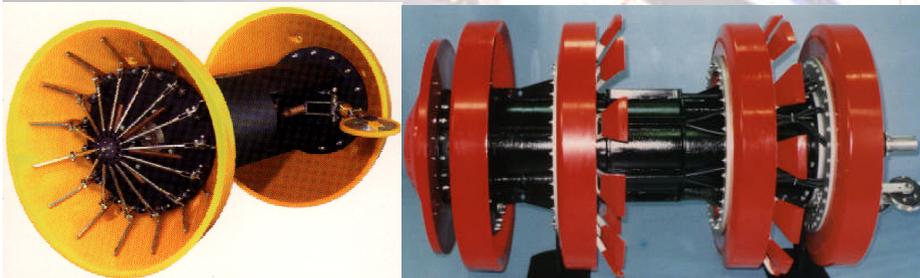
- **Magnetic flux leakage (MFL)**
 - **High and low resolution axial**
 - **Circumferential (TFL or transverse flux inspection)**
- **Ultrasonics**
 - **Normal beam (wall thickness)**
 - **Angle beam (cracks)**





Types of Intelligent or Smart Pigs

- **Geometry - Bore diameter and dent detection & Pipeline mapping**
 - **Caliper**
 - **Slope/Deformation**
 - **INS / GPS**
- **Research areas**
 - **Electromagnetic acoustic transducer (EMAT)**
 - **Eddy currents, remote fields, velocity induced, etc., etc.,**



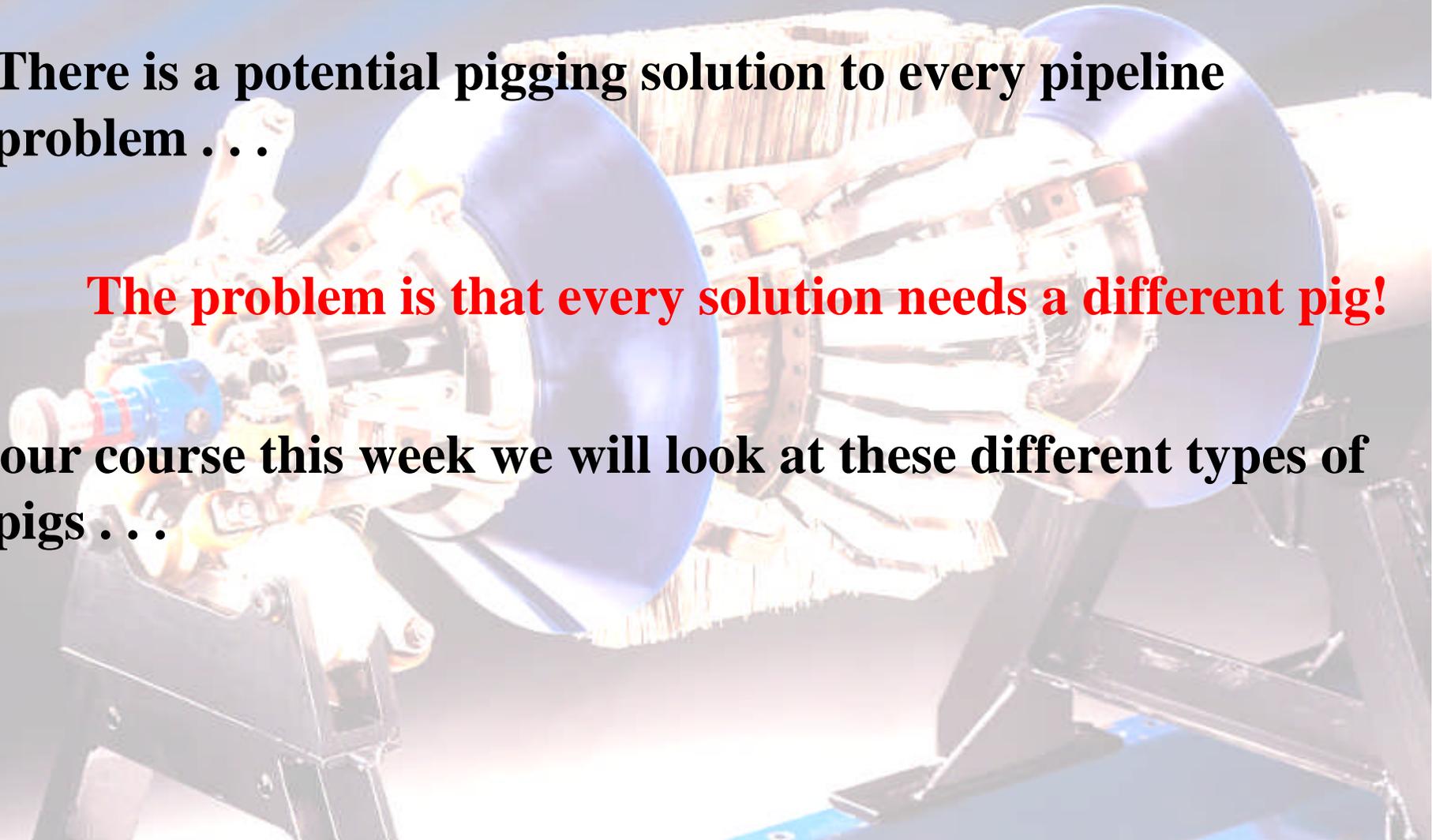


Pigging Solutions

- There is a potential pigging solution to every pipeline problem . . .

The problem is that every solution needs a different pig!

In our course this week we will look at these different types of pigs . . .



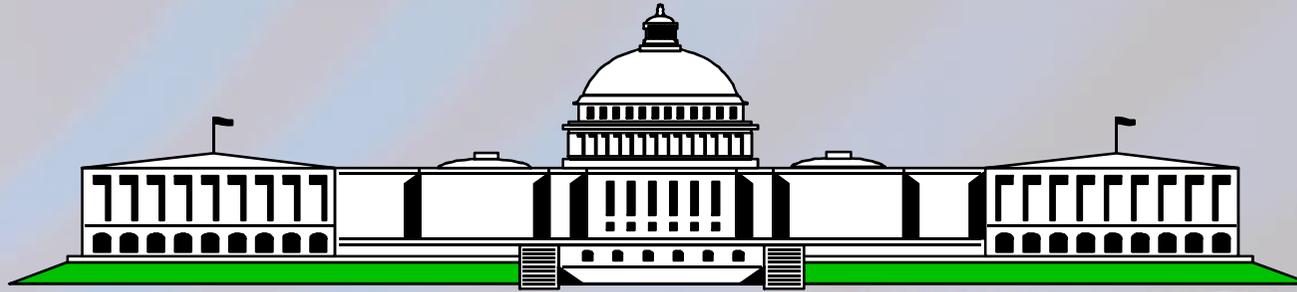


Part 195.120

Passage of Instrumented Internal Inspection Devices







Passage of Instrumented Internal Inspection Devices

Amendment 192-72

Amendment 195-50

59 FR 17275 April 12, 1994

Effective date: May 12, 1994



195.120 Passage of internal inspection devices.

- ▶ (a) Except as provided in (b) & (c), each new pipeline and each *line section* of a pipeline where the line pipe, valve, fitting or other line component is replaced

continued



195.120 Passage of internal inspection devices.

” must be designed and constructed to accommodate the passage of instrumented internal inspection devices.

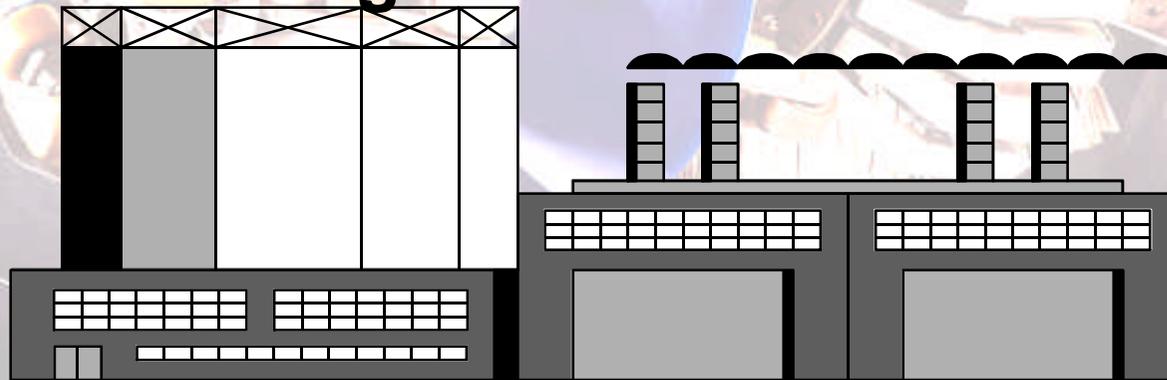




Does not apply to:

” 195.120(b)

- **Manifolds.**
- **Station piping such as at pump stations, meter stations, or pressure reducing stations.**



continued



Does not apply to:

” 195.120(b)

- **Piping associated with tank farms and other storage facilities.**
- **Cross-overs.**
- **Sizes of pipe for which there are no commercially available inspection devices.**

continued



Does not apply to:

” 195.120(b)

- **Offshore pipelines, other than main lines 10 inches or greater in nominal diameter, that transport liquids to onshore facilities.**



continued



Does not apply to:

- ” 195.120(b)
 - **Other piping under 190.9, that the Administrator finds in a particular case would be impracticable to accommodate inspection devices.**



Emergencies & Unforeseen Construction Problems

” 195.120 (c)

- If operator encounters construction time constraint, emergency, or unforeseeable construction problems-
 - Must document circumstances
 - Within 30 days of discovery, must petition under 190.9
- May make a provisional determination of impracticability





Emergencies & Unforeseen Construction Problems

” Part 190.9 Petition for finding or approval.

- If pipeline is **INTRASTATE** and there is a certified state agency--petition goes to state agency
- If pipeline is **INTRASTATE** and there is **NO** certified state agency--petition goes to PHMSA
- If pipeline is **INTERSTATE**--petition goes PHMSA





Emergencies & Unforeseen Construction Problems

” 195.120 (c)

- *If petition is denied, the operator has **1 year** after date of the notice of denial to modify pipeline*

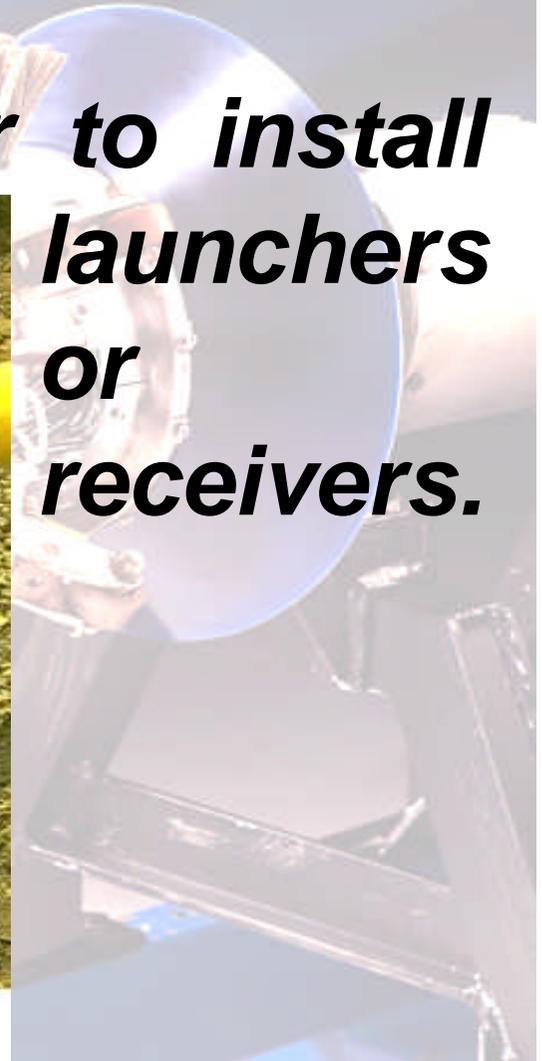




Launchers and Receivers

” 195.120

- **Does not require operator to install launchers or receivers.**





History of Intelligent Pigging



This Presentation
was

Created with pride in the



The End

