The logo for SafetyInEngineering consists of a large, stylized 'S' shape formed by multiple parallel lines. The text 'SafetyInEngineering' is positioned within the lower-left portion of this shape.

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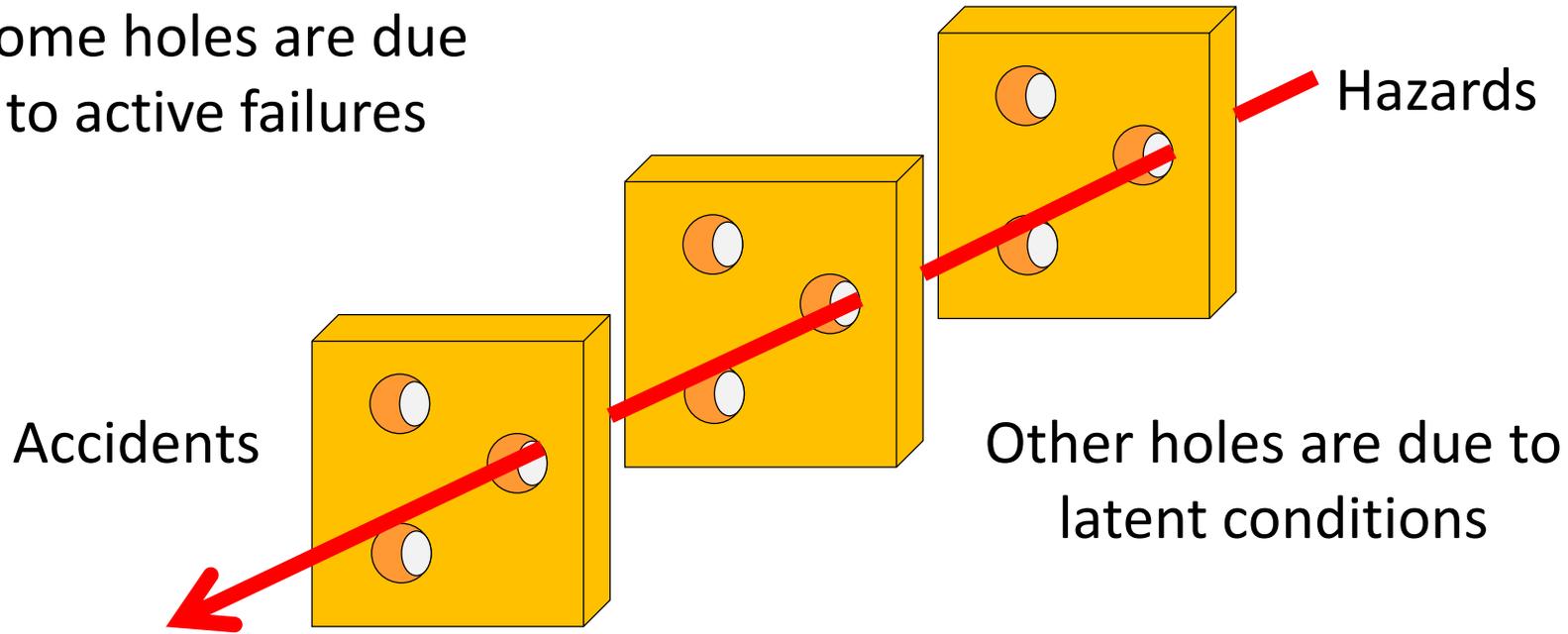
Whatcom Falls Park pipeline rupture, 10 June 1999

Jim Thomson

www.safetyinengineering.com

EM&I, 12 November 2015

Some holes are due to active failures



Other holes are due to latent conditions

Each layer of cheese represents a safety system, an operational procedure, or some other barrier against an accident. However, all such defences have weaknesses (holes). Accidents occur when the holes are aligned.

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The Whatcom Falls Park accident is an egregious example of poor safety culture pervading several organisations and their associated contract support companies.

NOBODY SEEMED TO CARE.

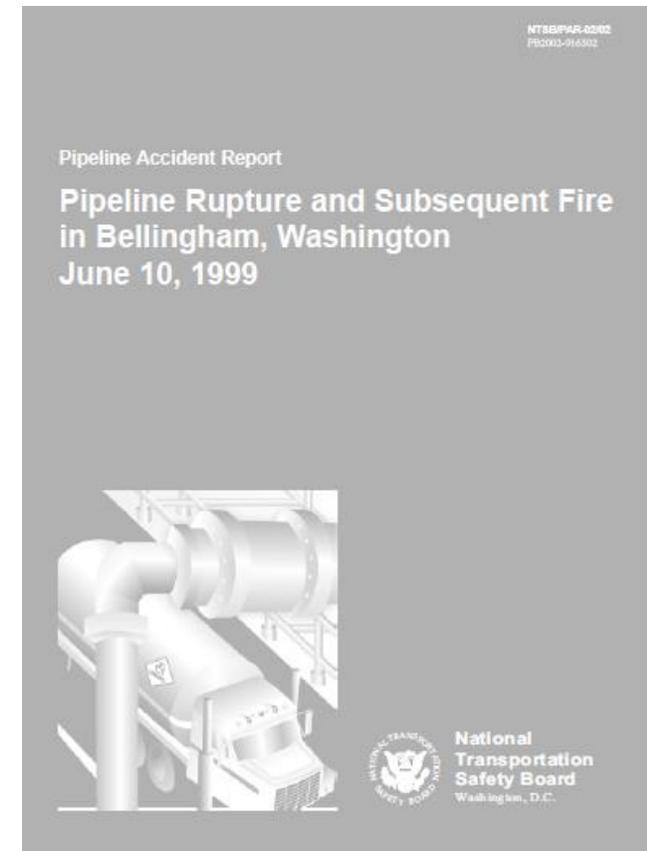
Video:

<https://www.youtube.com/watch?v=AJRwePrctGw>

Reference:

US National Transportation Safety Board, “Pipeline rupture and subsequent fire in Bellingham, Washington, June 10, 1999”, NTSB/PAR-02/02, 8 October 2002

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Location: Whatcom Falls Park, Bellingham, Washington State.

The pipeline was operated by Olympic Pipeline Company, but operation was contracted to another company, Equilon (which was part-owned by Shell).

After the accident, Equilon claimed it was not responsible for operation – it only sold personnel to Olympic.

So, immediately, there is conflict over responsibility!! Because the responsible staff were mostly contractors, it appears that Olympic thought that they had contracted out their liabilities also.....



Figure 2. Olympic Pipe Line Company system.

The complete timeline of missed opportunities and mistakes that led to this accident can be summarised as follows:

1. The pipeline was damaged during excavation work carried out IMCO probably on 11th August 1994.

This damage was not reported to Olympic.

(Bellingham Council had placed contracts with two companies (IMCO General Construction Inc and Barrett Consulting Group, subsequently known as Earth Tech) to implement the modifications at the water treatment plant which was built above the pipeline.

The arrangements were supposed to be that Olympic personnel would be present whenever excavation happened within “ten to fifteen” feet of the pipeline, and that all excavation within two feet of the pipeline would be only by hand; that is, no mechanical diggers were to be used close to the pipeline. Olympic inspectors also made unannounced visits to the work site on a regular basis, more than once per week.

*Excavation around the Olympic pipeline occurred in August 1994, without Olympic inspectors being present, in order to lay a new water pipeline which crossed over the gasoline pipeline. **A subcontractor to IMCO told the accident investigators that he heard the gasoline pipeline being struck by a backhoe - a powered mechanical excavator - during the project, probably on 11th August 1994, when an Olympic representative was not present, and that IMCO personnel decided not to notify Barrett or Olympic.***

The subcontractor said that IMCO personnel coated the damaged area of pipeline with a mastic coating before backfilling over it. A labourer working for IMCO also recalled IMCO hitting the pipeline. All other IMCO employees denied this account.)



Figure 10. Removal of ruptured pipe section.



Figure 12. Inside view of second removed pipe section showing dent.



Figure 13. Rupture location before removal of pipe showing proximity of water line tee connection.

2. A magnetic inspection carried out on 18th March 1996 by Tubascope Linalog Ltd did show anomalies in the region of the eventual pipe rupture. **The anomalies were assessed to be insignificant**, but the ASME-approved technique was intended for corrosion damage (and not for mechanical damage).

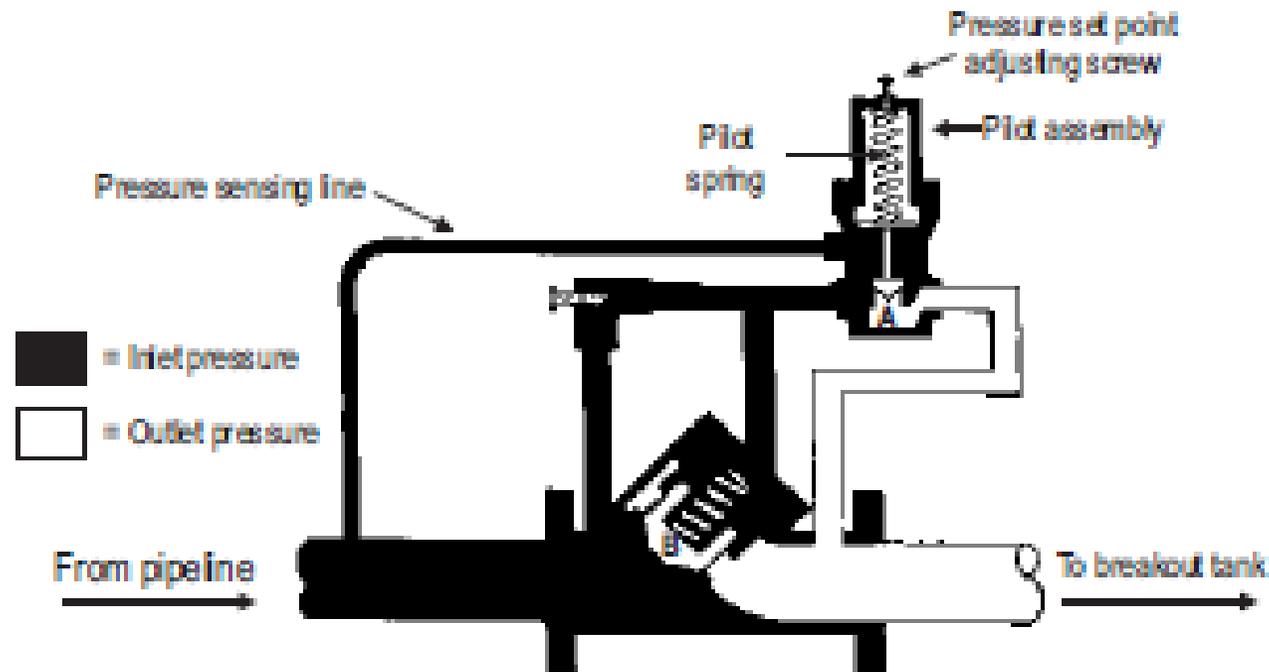
3. Following an incident elsewhere, **another inspection was carried out under instruction from Washington State** on 15th January 1997 using a different inspection technique, by Enduro. A “sharp defect” was reported near the eventual failure site.

4. However, the ground was too wet to allow excavation and it was agreed (with a junior engineer in Olympic) to excavate later when it was drier. **No subsequent excavation took place.**

5. **A new gasoline terminal at Bayview** (built by Jacobs on contract to Olympic) was installed some miles downstream and commissioned on 17th December 1997. **It had a lower operating pressure than the pipeline**, so a flow control valve was installed, with a relief valve arrangement and emergency stop valves as backups, was installed

6. **The pressure relief valve was not set up properly so it did not function, and it was not tested so the improper set-up was not revealed.**

7. Because the relief valve was not opening when required, there were **41 separate occasions when the isolation valves operated because of overpressure. None of these was investigated.**

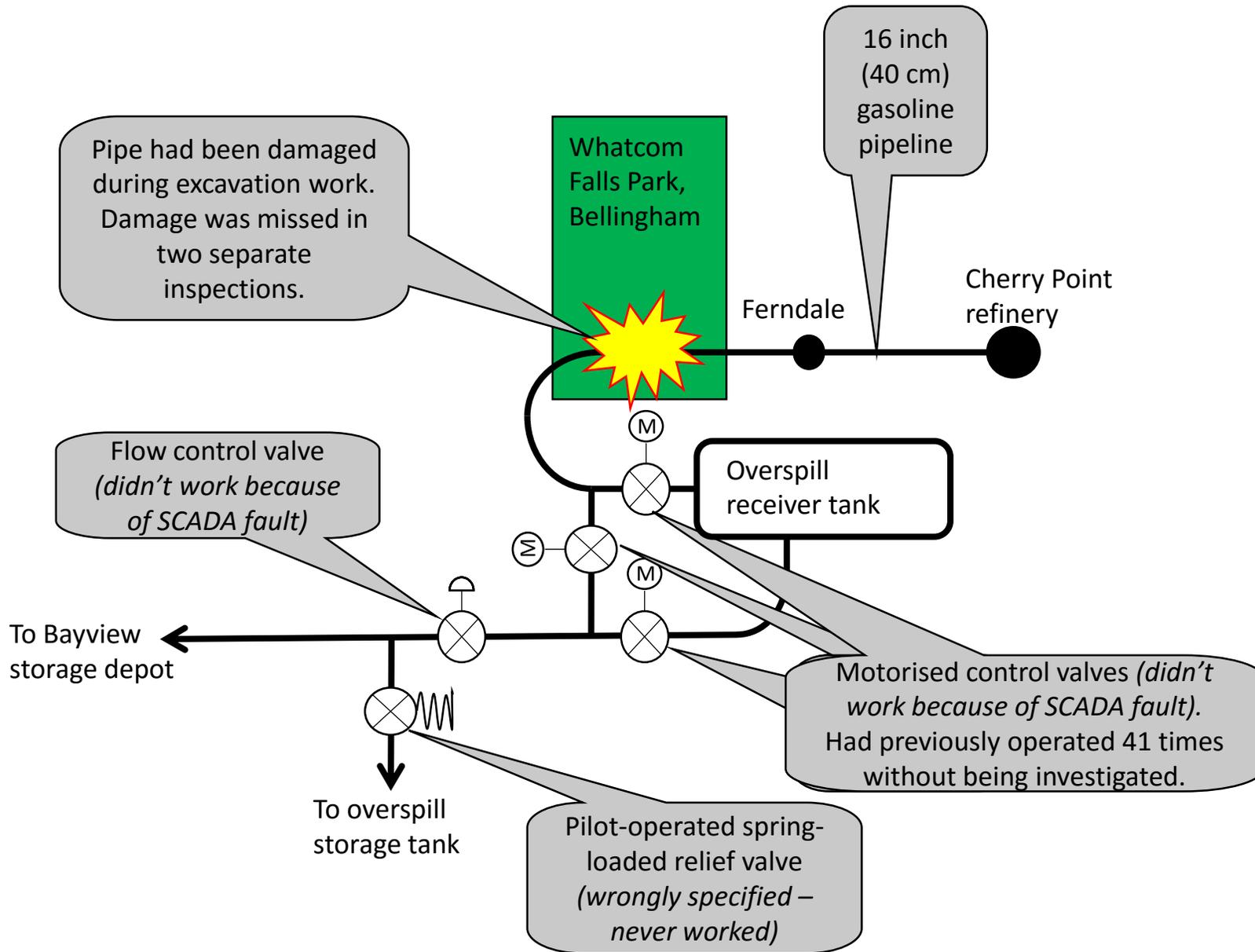


9. On the day of the accident, 10th June 1999, **the computer system administrator had doing software development work on the live SCADA system** which controlled the entire pipeline system, including the isolation valves.

10. For reasons unknown, this **development work caused the whole SCADA control system to become unresponsive.**

11. **This occurred at the same time as the pipeline system controller was switching delivery points, which led to a pressure pulse going through the system.**

The result of all the above was that a pressure pulse occurred, but the relief valve had never worked, and the control system was unresponsive, so the isolation valves did not operate. The pipeline pressure rose and the pipe ruptured at the defect caused by the excavation damage in August 1994, allowing one million litres of gasoline to flow down a river creek on a summer afternoon, where it caught fire and killed three people.



Probable cause of the accident was ascribed to:

1. Damage done to the pipe by IMCO General Construction Inc during the 1994 water treatment plant modification project. Olympic Pipeline Company's inadequate evaluation of on-line pipeline inspection results.
2. Olympic Pipeline Company's failure to test, under approximate operating conditions, all safety devices associated with the new Bayview Terminal.
3. Olympic Pipeline Company's failure to investigate and correct the conditions leading to the repeated unintended closing of the Bayview inlet isolation valve.
4. Olympic Pipeline Company's practice of performing database development work on the SCADA system while the system was being used to operate the pipeline, which led to the system becoming non-responsive at a critical time during pipeline operations.

Summary

- This was a long and sorry tale of many people, over five years, all of whom failed to carry out their duties properly.
- It is difficult from the report to be sure exactly how many people were involved in unsafe acts and poor decisions, but there must have been at least twelve individuals involved.
- Mostly, their failings were simply laziness, indifference, or cynicism.
- There was no evidence to suggest time pressure, or financial pressure. It was just that people *couldn't be bothered*. No-one cared about what they were doing, and as a result two ten-year old boys and an eighteen-year old man were killed.

Ingredients for safety management and good safety culture in hazardous industries

Fundamental hazard awareness (i.e. “What could happen if things go wrong?”)

- Safety induction training for all staff and contractors

Safety management processes:

All of these processes were either absent or failed at Whatcom Falls Park:

1. *Suitably trained and qualified people (SQEP)*
2. *Safety Justifications (or cases)*
3. *Identification of safety-related equipment*
 - a. Operating rules (“Thou shalt not...”)
 - b. Maintenance, Inspection and Test (MIT) arrangements
 - c. Engineering Change Management
4. *Work Control System*
5. *Organisational Change Management* (since control room staff seemed unaware of how the pressure relief system should work)
6. *Procurement processes* (wrong relief valve spring)
7. *Corrective Action Tracking* (since investigation of the “sharp defect” never took place)
8. *etc*

Leadership, Leadership, Leadership, Leadership.....

At all levels within the organisation, but starting from the top!

If your Board meetings consist of endlessly reviewing spreadsheets and discussing cash flow forecasts, ***think again.***

Thank you!