

Homework Assignment – Unit 2

Objective: Identify examples of cohesive devices (formal links) in the research paper you selected last week.

Instructions

1. Read through your selected research paper.
2. Find at least two (4) examples of each of the following cohesive devices:
 - Reference
 - Substitution
 - Ellipsis
 - Conjunction
 - Lexical Cohesion
3. Open the shared Google Drive Word document and organize your findings under the corresponding headings of cohesive element.
4. Under each heading, copy the exact sentence or excerpt from your paper that contains the cohesive device. Highlight or underline the cohesive element.

Purpose: By contributing examples from different research papers, we will create a shared collection of authentic examples that will help us better understand how cohesive devices contribute to the structure and organization of a text.

Paper: Direct backward transient analysis for leak detection in pressurized pipelines: from theory to real application.

Reference

After that, an optimization problem is defined with a least squares criterion objective function. **This** problem is to minimize the difference between the measured and calculated pressure or flows.

The current work aims to overcome some of the main uncertainties of ITA by introducing a novel time-domain approach for leak detection in pressurized pipes.

Brunone's model has been found as one of the easiest to be implemented and has better results in modeling unsteady friction effects. **It** has been validated thorough many experimental works.

Besides, there are several uncertainties and undetermined parameters which influence the model reliability, **such as** the valve maneuver, unsteady friction losses, initial steady state conditions and collected transient data.

Substitution

This program was carried out jointly by Scottish Water (SW), ...and University of Perugia (UoP)...**One** of the branch mains of this systems, namely “Balmashanner main”, has been considered herein as the case study.

Brunone’s model has been found as **one** of the easiest to be implemented and has better results in modeling unsteady friction effects.

There is no need to define Direct backward transient analysis upstream boundary conditions since they are automatically calculated by the model. **So**, not only some major modeling difficulties are removed when using BTA, but also significant uncertainty sources are totally avoided

In the absence of leaks, BTA is a determined problem that is totally independent of the upstream boundary conditions. Consequently, the observed and calculated flow characteristics at the upstream boundary would be the **same**. (I’m not sure)

Ellipsis

Steady or quasi steady assumption of friction losses is satisfactory for slow transients where the wall shear stress has a quasi-steady behavior; however, **(it)** is considerably imprecise for fast transient events. (I’m not sure)

To generate a transient event in a pipe, the type of valve, the closure time and the maneuver not only affect the effectiveness of the transient event on leak detection, but **(they)** are also very important to the numerical model for which the valve maneuver should be precisely simulated. (I’m not sure)

Conjunction

It has been validated through many experimental works. **Nevertheless**, uncertainties due to the estimation of Brunone’s and also quasi-steady coefficients can still be significant, especially in rapid transients which are very important for leak detection purposes.

MOC is the most popular technique to analyze transient state in pipe systems. **However**, the traditional scheme of MOC cannot be applied herein since initial conditions and valve description have been omitted from the modeling. **For this purpose**, a new scheme of MOC introduced by Shamloo & Haghighi (2009) is applied to backwardly described the transient state conditions. **Simply speaking**, equations of continuity and momentum are linearly combined and the resulting ordinary differential equations are integrated along new semi-implicit positive line PC and explicit negative line PA.

Lexical Cohesion

This importance is more serious in case of real-life pipes generally with old worn-out valves. In **these systems**, the valve should be closed with a slow maneuver to prevent the occurrence of undesirable waterhammer waves.

Using the first period of the measurements at the downstream end, since the theoretical period of the transient is $T = 4L/a$, the wave speed is estimated at 1,187 m/s. Considering the sampling frequency and the wave speed, it is concluded that the transient analysis grid can be developed with time step $\Delta t = 0.05$ s and the space step $\Delta x = 59.35$ m. This also means that all estimations of the leak locations include at least ± 59.35 m uncertainty. With **this information**, the pipeline can be analyzed searching for leaks using BTA.

In this method, **the mentioned steps** for Inverse Transient Analysis are significantly simplified, and many uncertainty resources in modeling are removed.

Using the direct solution method, one stage backward analysis is enough for leak detection. Consequently, **the method** is very fast with very few calculations.