KAWASAKI STEEL TECHNICAL REPORT
No.25 (September 1991)
Special Issue on 'H-Shapes with Fixed Outer Dimension' and 'Steel Pipe'

Transient Flow Analysis for the Manageme nt of Water Pipeline Network System

Takeshi Koike, Toshio Imai, Tadashi Teramoto, Minoru Suzuki, Shota Miyake

Synopsis :
A computer program is described for the transient flow analysis of water pipeline networks. This program was developed by Kawasaki Steel to simulate transient phenomena in a complete water pipeline, including valves, pumps, reservoirs and leakage points. In order to check the accuracy of this program, a field test was run on an existing water transmission pipeline in Is hikawa prefecture. The numerical analysis show good agreement between experimental data and simulated results within a maximum error of 3.7% in pressure. This program can play an important role in managing a large-scale water pipeline netw ork when used as part of the lifeline information management system (LIMAS), wh ich was developed by computer mapping techniques. This flow analysis program ex tends the applicability of LIMAS to many fields of waterworks such as future water su pply planning, short-term flow prediction in daily operation, and leakage flow control.

The body can be viewed from the next page.

KAWASAKI STEEL TECHNICAL REPORT No. 25 September 1991

Transient Flow Analysis for the Management of Water Pipeline Network Systems*



Synopsis:

A computer program is described for the transient flow analysis of water pipeline networks. This program was

2.1 Formula for Steady Flow

θ: Angle of pipe inclination

Consider a steady state flow in a single pipe with a node at each end. The water head (H) and flow rate (Q)

Here, a in Eq. (8) is the velocity of the pressuree wave

specifications of the valve and data on the valve

wide variety of characteristics data on the pipeline

open ratio.

(4) Leak point makes it possible to simulate leakage by defining the diameter of the leakage hole or data on

can be easily handled by the RDB incorporated in the mapping system.

(2) Once the RDB has been constructed, the facility can

the leak flow rate

be managed for its daily maintenance operations.

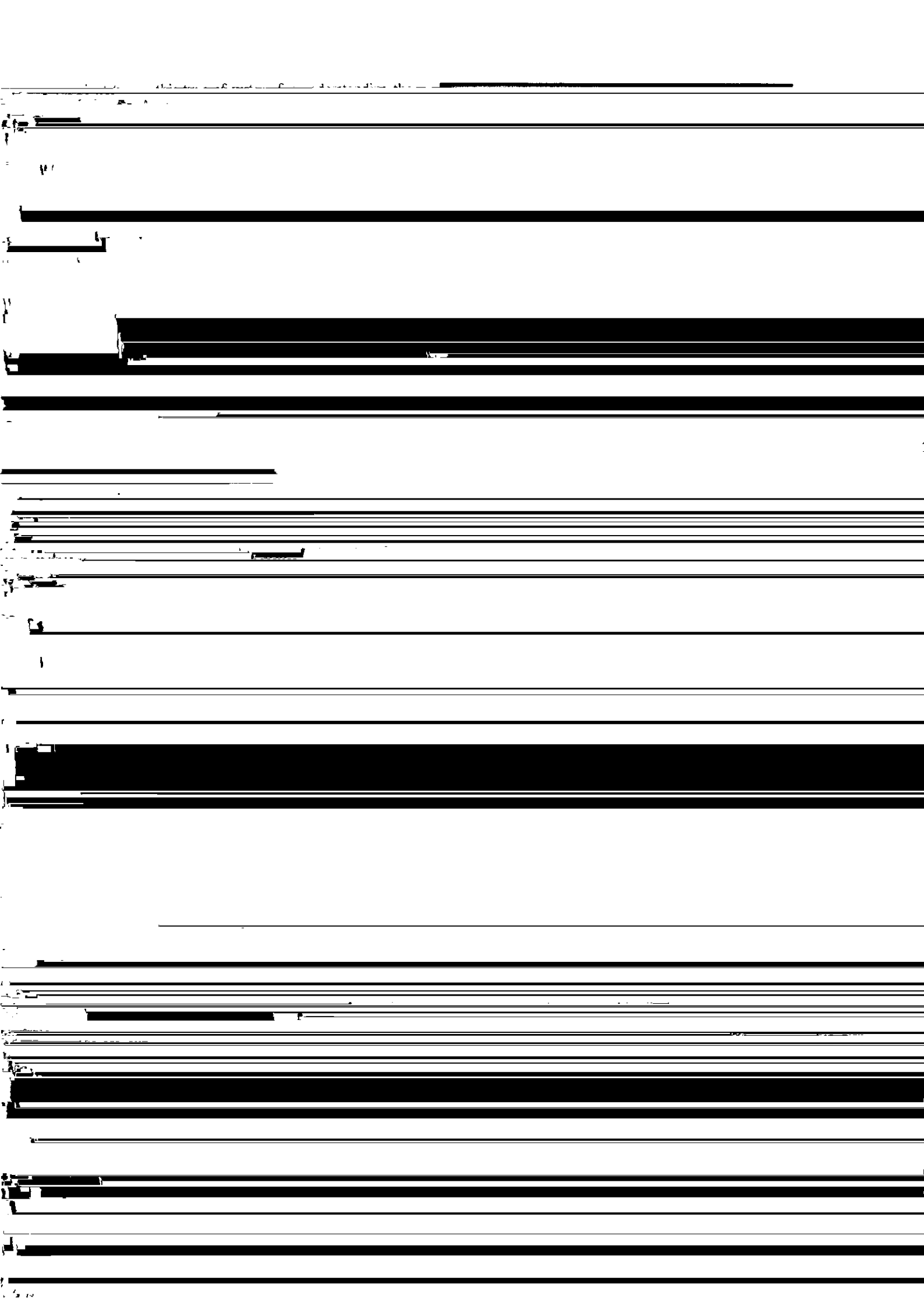
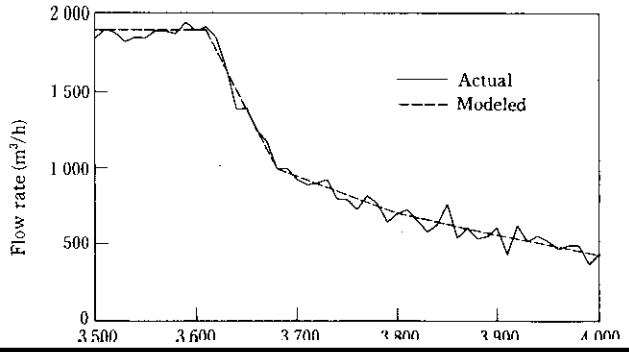
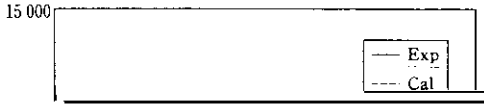


Table 1 Pipeline specifications

No.	Link ID	Dia. (mm)	Length (m)
1	L-01	1 800	1 142
2	L-02	300	217
3	L-03	1 800	829
4	L-04	1 350	274
5	L-05	1 350	274
6	L-06	1 800	264
7	L-07	1 350	286
8	L-08	1 350	286





synchronized demand flow changes ($t = 100$ s), and these waves spread to the other points after some delay. The characteristics of these pressure waves are similar

reservoirs shown in Fig. 8 on the other hand, the pres-

sure amplitude was slower to decrease, taking more than 400 seconds until the flow conditions returned to their steady state. Since the maximum amplitude of

cm^2 it must be noted that these phenomena should be avoided in order to protect the pipeline system from structural damage.