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## **Flow Induced Pulsation And Vibration**

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Machinery provides a compact guidebook explaining the many different underlying physical mechanisms and their possible effects. Typical phenomena are described to assist in the proper diagnosis of

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problems and various  
key strategies for  
solution are compared  
and considered with  
support from practical  
experience and real-life  
examples.

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## **Flow-Induced Pulsation and Vibration in Hydroelectric ...**

However, progress in  
this field is hampered



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by the interdisciplinary  
nature of the subject,  
between fluid  
mechanics, structural  
mechanics and  
hydraulic transients.  
Flow-induced Pulsation  
and...

## **Flow-Induced Pulsation and Vibration in Hydroelectric ...**

Pulsations and  
Vibrations. The varying  
flow caused by  
reciprocating pumps,

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compressors or  
process conditions  
leads to a pulsating  
flow within the  
connected piping.

Excessive pulsation  
amplitudes can lead to  
mechanical vibrations  
and thereby fatigue  
failure of the piping or  
supporting. To avoid  
these problems good  
system design is key  
and here DRG can be  
your perfect partner.

**Pulsations and**

*Page 10/27*

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## **Dynaflow Research Group**

This class of flow-induced vibration is often decoupled such that the fluid dynamics and structural dynamics can be analyzed separately. On the fluids side, analytical techniques are available to estimate the magnitude and duration of fluid shock loads.

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## **Flow-Induced Vibration Problems**

FLOW-INDUCED

VIBRATION (FIV) FIV

refers to vibration that  
excites the low-

frequency regions of  
the pipe ( $<100$  Hz).

This usually takes  
place at pipe bends,  
reducers, and fittings  
and leads to beam  
mode vibration, which  
causes the pipe to  
displace longitudinally  
and transversely.

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Figure 7 shows beam  
mode vibration.

## **Differentiating Between Acoustic and Flow-Induced Vibration**

Flow-induced vibration,  
or vortex shedding, is  
due to high flow  
velocities such as in a  
piping dead leg of a  
centrifugal compressor  
system. This study  
evaluates vortex  
shedding and potential  
vibration across dead

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leg branches. The  
study can also include  
FIV excitation of small-  
bore piping and  
components in the  
flow, such as  
thermowells.

**Flow-Induced  
Vibration (FIV)  
Analysis (Vortex  
Shedding ...**

In contrast to steady-  
flows, however,  
unsteady flow, e.g. due  
to pump-induced  
pulsation or acoustical

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And Vibration In  
effects, can and often  
does cause serious  
vibration problems (see  
Section 1.1), especially  
when light-gauge, low-  
damping piping is  
used, or in conjunction  
with flexible supports.

## **Piping Vibration - an overview |**

### **ScienceDirect Topics**

Flow-induced pulsation,  
vortex-induced  
vibration (VIV) from  
flow past intrusive  
elements (the

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And Vibration In  
thermowells) and small  
bore Figure 1:Pipe  
section layout  
connections were all  
identified as limiting at  
least two of the three  
operating cases  
assessed.

## **Introduction to pipeline flow- induced vibration**

The hydraulic noise  
and vibration inside  
ESP are mainly induced  
by the internal  
pressure pulsation,



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And Vibration In  
which is an important  
reference index for  
ESPs' operational  
stability. The  
mechanism and  
characteristics of  
pressure pulsation in  
multistage pump is not  
clear until now, which  
is more complex and  
difficult than a single  
stage pump.

**Interstage  
difference of  
pressure pulsation  
in a three ...**

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analysis. In general, a piping flexibility study calculates the reaction loads and stresses resulting from gravity, internal and external pressure, temperature fluctuations and flow induced loads.

## **Piping Flexibility Analysis - Sim Engineering**

This is often due to flow induced vibration (FIV) and acoustic

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And Vibration In  
induced vibration (AIV),  
and is related to the  
flow of the main  
process fluid through  
the piping system.

Other possible sources  
of piping vibration  
include: Mechanical  
vibration and  
pulsations from  
compressors and  
pumps;

**Piping vibrations |  
Flow induced &  
acoustic induced ...**

Vibration survey and

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measurement was done at Site, and INERTANCE engineers checked if there was no high vibration issue for piping system with existing condition. And, the measured vibration levels were compared with related vibration criteria such as EFRC (European Forum for Reciprocating Compressors), ISO 10816-8 and Wachel chart, etc.

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## **Compressor Pulsation Study, Three stage reciprocating ...**

Engineers and project planners struggling with the practical problems will find Flow-induced Pulsation and Vibration in Hydroelectric Machinery to be a comprehensive and convenient reference covering key topics and ideas across a range of relevant

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disciplines.

Hydroelectric  
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In order to overcome  
this operational  
restriction, a series of  
flow trials w as  
performed. These trials  
involved performing  
real-time monitoring of  
pressure pulsation and  
vibration levels from  
numerous at-risk  
locations

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And Vibration In  
simultaneously, while  
incrementally  
increasing the gas lift  
flow rates. Problem

Engineers

## **Flow Induced Pulsation (FLIP) Assessment | Xodus Group**

Vibration is caused by  
a number of sources,  
including: External  
flow: tidal or current  
loading, leading to  
vortex-induced  
vibration (VIV) Internal  
flow: flow-induced

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vibration (FIV)  
including flow  
turbulence (FIT),  
multiphase and  
slugging, flow-induced  
pulsation (FLIP/singing  
flexibles and deadleg  
excitation)

**Subsea Piping  
Vibration (VIV, FIT,  
FIV, FLIP) | Vibration**

...

Vibrations and  
pressure pulsations in  
hydraulic turbine draft  
tubes may arise under



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partial load operation. In general, the central and circumferential parts of the flow that enter a draft tube from a runner, swirl as a forced vortex and a free vortex, respectively. The vortex core has very low pressure; thus, air cavities appear.

**Pressure Pulsation -  
an overview |  
ScienceDirect Topics**  
predominate in most

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And Vibration In  
industrial processes;  
flow induced (vortex  
shedding) and  
pulsation at multiples  
of running speed  
(blade-pass in  
centrifugal  
compressors and  
pocket-passing  
frequency in screw  
compressors). Once  
this energy is  
generated,  
amplification may  
occur from acoustical  
and/or structural  
resonances, resulting

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