

# Tuned mass damper with inerter and non-linear damper

Mateusz Lazarek, Piotr Brzeski and Pzemyslaw Perlikowski\*

\* Division of Dynamics, Lodz University of Technology,  
Stefanowskiego 1/15, 90-924 Lodz, POLAND

e-mail: przemyslaw.perlikowski@p.lodz.pl, web page: przemyslaw.perlikowski(at)p.lodz.pl

## ABSTRACT

One of possible solution to extend the efficiency of classical tuned mass dampers (TMD) is addition of an inerter [1]. Inerter is a mechanical device generating force proportional to acceleration between its terminals. In our previous papers we show that tuned mass damper with inerter (TMDI) can significantly decrease amplitude of oscillation of damped body [2,3]. In this paper we study the dynamics of two degree freedom system, which is consist of main body and (TMDI) with additional dash-pot with nonlinear damping characteristic. We study influence of non-linear dash-pot on efficiency of proposed device. The non-linear characteristic of the dash-pot is dependent on one control parameter which governs the steepness of the function and the value of damping coefficient changes according chosen function. To compare two types of characteristic we use smooth and non-smooth non-linear damping functions. We show that such TMDI can be more efficient than device without non-linear damper.

## REFERENCES

- [1] M. Smith, *Synthesis of mechanical networks: the inerter*, Automatic Control, IEEE Transactions on **47**, 1648 (2002).
- [2] P. Brzeski, M. Lazarek, P. Perlikowski, *Experimental study of the novel tuned mass damper with inerter which enables changes of inertance*, Journal of Sound and Vibration **404**, 47-57 (2017)
- [3] M. Lazarek, P. Brzeski and P. Perlikowski: "Design and identification of parameters of tuned mass damper with inerter which enables changes of inertance", *Mechanism and Machine Theory* **119**, 161-173 (2018).