DOI	https://doi.org/10.1016/j.ijmecsci.2020.105927
Title	Dynamic response of post-tensioned rocking structures with inerters
Background	
Why this paper? How'd you find it?	During my literature review at the beginning of the PhD I read some things about rocking structures, and rocking structures, as a type of isolation system. However, rocking behavior can lead to overturning if the rotations at the base of a structure are too large. In an effort to control such rotations, additional damping and dissipation devices are used at the base of the structure to reduce the displacement and rotation demands, at the expense of larger base shear. I found this paper looking for innovative ways to deal with the problem of excessive rocking.
Study Objective	Determine the effectiveness of inerters as a way to improve the seismic performance of post-tensioned rocking structures.
Intended gaps to fill	Quantify the seismic performance of post-tensioned rocking structures with inerters, and its difference when no interters are used. Test the efficacy of the interters in reducing structural demands, without affecting other relevant structural response parameters.
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Funding Source	
Journal / Field	International Journal of Mechanical Sciences
Date	2020
Historical Context	Housner (1960s) first studied the behavior of rocking blocks, with two main findings: larger blocks are more stable than smaller blocks, and that rocking structures are practically base-isolated, since the base shear caps at the level at which the structure initiates rocking. Implementation of such ideas on real structures has been done in the past (bridges and modern rocking structures) but with a major modification: some self-centering device that stops the rocking behavior if it goes too far. Some of these systems include the use of post-tensioned tendons that activates when the structure initiates rocking, and energy dissipation devices added at the base of the structure, like dampers or flexural yielding-based devices. Makris and Kampas (2016) and the authors introduced the concept ot the clutch inerter, a device that adds rotational inertia when the structure wants to leave its centered position, to reduce stuctural demands.
Relationship to SEMM	Structural Dynamics, Seismic Protective Systems and Structural Control
Methods	
Given:	A new energy dissipation device (the interter) and a post-tensioned structure
Find:	How much can the response of a theoretical structure be improved in terms of demand parameters (rotations, accelerations, base shear).
Experimental Design	Analytical model of the rocking structure (equations of motion are derived), and analytical model of the inerter based on assumptions on how it works. They run analyses with Ricker Wavelets (commonly used for evaluation of structures susceptible to pulses / near fault ground motions) to study the dynamic behavior with and without inerters, in combination with the post-tensioning system. Evaluation is based on rocking spectra. Then, they run a probabilistic hazard calculation with real grond motions to further investigate the effectiveness of the inerter in reducing the structural demands.
Test Subjects	Analytical model of a rocking structure with and without inerters.
Results	
Baseline for comparison	Structure without inerter
Metric for comparison	Rocking spectra, frequency vs acceleration, and rotation. Base shear.
Difference from baseline	There is a reduction on accelerations and rotations for structures with inerters. However, base shear remain comparable.
Conclusions	
Authors'	The addition of the inerters further improves the seismic performance of rocking rigid blocks by reducing the accelerations and the peak rotations experienced by the structure in a wide range of frequencies. The forces added by the inerter are comparable to the ones in the post-tensioning system, which is proof that the method can be implemented in practice with adequate detailing.
Yours	The interters seem to be a promising dissipation system, as they work as something in between an inertial damper, and a frictional device. However, unlike the tuned mass damper, which in some cases may amplify the response, the inerter is designed so it always goes against the response (always ends up in a reduction, theoretically). However, it incorporates forces to the structure at the inerter level, which need to be considered in the design of the structure. The latter reduces the benefits of having the structure isolated by a rocking mechanism in the first place, same thing as with the post-tensioning system. More studies are necessary to understand the behavior of the inerter in practice (since little experimental research has been conducted so far), and on evaluating whether the rocking mechanism alone is a better option than incorporating additional dissipation mechanisms to the structure (is it better to take energy out of the structure after it got in, or is it better to isolate the structure and avoid the energy to come into the structure?)
Applications	Structural design with energy dissipation systems. Retrofit of existing structures, to reduce structural demands.