

CONTENTS

1. INTRODUCTION	7
1.1. Preface	7
1.2. The genesis, scope and aim of the monograph.....	8
2. CURRENT KNOWLEDGE OF THE DYNAMICS OF CRANES; IN PARTICULAR, OVERHEAD TRAVELLING CRANES	12
2.1. Overhead travelling cranes - basic machines for in-plant cargo transport	12
2.2. Review of issues related to standardisation in the field of cargo movement modelling and load actions	20
2.2.1. Force from hoisting and gravity effects acting on the mass of the crane	22
2.2.2. Dynamic force of the sudden release of the hoist load.....	25
2.2.3. Force caused by travelling on uneven surface.....	27
2.2.4. Force caused by acceleration of drives	28
2.2.5. Force due to in-service wind	29
2.2.6. Force caused by skewing	31
2.2.7. Forces caused by hoisting a grounded load at maximum hoisting speed	33
2.2.8. Forces from test loads.....	33
2.3. Selected issues regarding modelling of overhead-travelling cranes and hoist load movement and vibrations in Polish and world literature	34
3. SELECTED EXPERIMENTAL AND NUMERICAL TESTS OF CRANE STRUCTURES AND HOISTING MECHANISM	41
3.1. Parameterisation of structural features of double-girder overhead travelling cranes with lifting capacity $Q = 5 \div 50$ t.....	41
3.2. Determination of dynamic parameters of a parameterised set of overhead traveling cranes load-carrying structures	49

3.3. Numerical identification of the dynamic coefficients caused by picking up the load from the ground	53
3.3.1. Formulation of the numerical model of load pickup from the ground	53
3.3.2. Simulation results	58
4. MODELLING OF NONLINEAR OVERHEAD TRAVELLING CRANES DYNAMICS IN 2D SPACE	63
4.1. Characteristics of selected tools used in model studies of non-linear dynamics	63
4.2. Formulation of calculation models of a modified mathematical pendulum and identification of chaotic motion zones.....	69
4.2.1. A model of an overhead travelling crane without taking into account the susceptibility of the rope	70
4.2.2. The model taking into account the susceptibility of the crane structure.....	74
4.2.3. The model with load-carrying structure vibrations and susceptibility of rope included.....	78
4.3. The idealization of hoist load movement	90
4.3.1. The results of model tests	91
5. MODELLING OF NONLINEAR OVERHEAD TRAVELLING CRANES DYNAMICS IN 3D SPACE	98
5.1. Formulation of a computational model of a modified spherical pendulum forced in two axes.....	98
5.1.1. Research results	101
5.2. Formulation of a computational model of a modified spherical pendulum forced in three axes.....	112
5.2.1. Simulation results	114
6. SUMMARY AND CONCLUSIONS.....	132
BIBLIOGRAPHY	135
ANNEX A	145
Abstract.....	151