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CASE HISTORIES IN OFFSHORE ENGINEERING

EDITED BY

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While this book was in preparation the international scientific community had to mourn the untimely departure of CISM Rector Antoni Sawczuk. With his clear awareness of the potentialities of sound interactions and crossfertilization between mechanics and engineering, professor Sawczuk had expressed a particularly strong interest in the CISM courses in offshore engineering. Let this volume be one of the homages to the unfading memory of this outstanding scientist and engineer.

PREFACE

In little more than one decade, offshore engineering has developed from a relatively marginal area of unusual, highly specialized industrial activities, to a flourishing field in the main stream of today's technologies, with remarkable economical, social and political implications. All along this growth the involvement of applied mechanics has been crucial.

An offshore platform, together with its foundation, is required to withstand in service place a number of severe loading conditions (primarily, but not exclusively, wave forces) and other environmental effects such as corrosion. Moreover it must be constructed elsewhere, transported and installed, and all these phases further expand the variety of actions or interactions to be faced by the designer. Design must be closely related to the construction process and both are influenced by the peculiarities of the specific marine environment. Substantially the same remarks apply also to any major offshore pipeline. Ocean engineering is therefore interdisciplinary by its very nature and entails applications of various applied sciences, "in primis" of various branches of mechanics. As the resources of oceans and seas (primarily but not only oil and gas) are being exploited in deeper and deeper waters and more and more hostile environments, unusual or new problems arise, setting a real challenge to industry and to research and teaching institutions as well.

Awareness of this scenario gave origin to a series of CISM short courses on "Modern problems in offshore engineering" covering the main mechanics-related topics, namely: fluid loadings; structural mechanics problems; soil mechanics and foundation engineering problems; fracture and fatigue; corrosion and material properties; reinforced concrete; safety and monitoring; case histories.

The lecturers have been well-known experts from universities, industries and certification agencies: A. Agostoni, M. Baker, A. Berti, P. Bettess, C.A. Brebbia, P. Bristoll, J.B. Burland, R. Butterfield, R. Dahlberg, R. Eatock-Taylor, N. Ellis, Y. Eprim, V. Giardinieri, E. Gnone, K. Hoeg, P. Holmes, C. Kirk, T. Kvalstad, D. Lalli, J. Leonard, S. Maddox, R. Matteelli, T. Moan, R. Olson, A.C. Palmer, P. Pedeferri, J. Radon, G. Sebastiani, I.M. Smith, S. Venzi, L.C. Zaleski-Zamenhof, O.C. Zienkiewicz.

Assembling and ordering in books the large amount of technical expertise presented in these courses would have been a useful but probably too ambitious task. However, CISM thought it suitable and not renounceable to offer at least the edited text of lectures on

"Case Histories" included in the fifth (1983) course to an audience broader than the attendees of the courses. This decision, which led to the present volume, was motivated not only by the fact that a monograph on this subject appeared to be not available in the technical literature. In fact, engineering objectives and realizations are the unifying factors and the culminating phase of all the relating scientific investigations and analyses. A knowledge of them is particularly important in an inhomogeneous, multifaceted technological area such as offshore engineering. Here Newton's saying "exempla docent non minus quam praecepta" (examples are no less instructive than theories, methods and rules) sounds particularly appropriate.

Lessons from successful realizations and from meaningful failures are equally instructive. Those examined in this book are presented concisely, with inevitable differences in style, standpoint and focused aspects. They are not intended to cover the complete range of categories of offshore structures. This would be a laborious, hardly possible task in view of the large variety due to inventiveness and creativity stimulated by drastic novelties in engineering situations and not (or not yet) inhibited by consolidated practice and regulations. Nevertheless, it is hoped that this book may appeal to most people interested in offshore engineering (from the practising engineers to researchers in related fields). In fact its aim is to provide an up-to-date conspectus, through typical "exempla", of the present offshore engineering and of some future prospects in it.

I feel indebted to the CISM Rectors and Secretary General for having asked me to act as coordinator of the series of CISM courses on offshore engineering and as editor of this book. I want to thank here all the lecturers, in particular those who contributed to this monograph, for their valuable cooperation and the participants for many stimulating discussions. The enthusiasm and effectiveness of lecturers, the intrinsic fascination of the subjects, the friendly though austere atmosphere of CISM, made this series of CISM courses a memorable experience for me and, I trust, for many attendees. I hope that part of all this will be transmitted to the readers, along with the rich first-hand information contained in this book.

Giulio Maier

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