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Songling Huang · Shen Wang

# New Technologies in Electromagnetic Non-destructive Testing



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# Preface

Electromagnetic nondestructive testing technologies have developed rapidly in recent years, and there have been some new methods or new applications. For example, the magnetic memory testing method for stress concentration of in-service pressure vessels is one kind of nondestructive testing technique emerging in the late twentieth century; the pulsed magnetic flux leakage testing technique for detection of corrosion defects in the pipeline with insulation or anti-corrosion layers is a new development of the original technology. In recent years, the theories and applications of electromagnetic ultrasonic guided wave testing, remote field eddy current testing, defect quantification in magnetic flux leakage testing, and pulsed eddy current testing have achieved rapid development, and these techniques are widely used in the online defect detection of oil and gas pipeline, rail track, pressure vessel, and so on.

This book introduces new methods and technologies in the electromagnetic nondestructive testing field, mainly including the electromagnetic ultrasonic guided wave testing technology, the pulsed eddy current testing technology, the remote field eddy current testing technology, the low frequency eddy current testing technology, the magnetic memory testing technology, and some key techniques in magnetic flux leakage testing. The theoretical models, methods of numerical simulations and designs, analysis of the influencing factors, implementation of the testing device, and some typical engineering application examples are given for each of these electromagnetic testing methods.

During the past more than 10 years, the authors have been conducting continuous research and practical applications in electromagnetic nondestructive testing, and much of the content of this book comes from the doctor and master theses guided by the authors. These students include Shen Wang, Wei Cui, Kuansheng Hao, Chaofeng Ye, Yun Tong, Yongsheng Zhang, Peng Li, Junjun Xin, Zhiyi Su, Yuhang Su, Xinyi Wu, etc. This book also references the latest research results by the relevant counterparts in this field. In the implementations of related technologies, we obtained considerable support and assistance from the leaders and

engineers of Sinopec, PetroChina, and CNOOC to ensure continuous improvement of the related technologies in practice. The author thanks those people sincerely!

Chapters 1–3 were written by Shen Wang, Chaps. 4–6 were written by Songling Huang.

With the growth in demand for nondestructive testing, research in electromagnetic nondestructive testing is drawing more attention, and the industrial applications even more widely. The authors hope that the publication of the book can provide references for the research and development staff, for students and teachers in universities, and engineers and technicians. If any error is found in the book, criticism and correctness from the readers are welcomed.

Beijing, China

Songling Huang  
Shen Wang

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