

Table of Contents

LECTURES

IDENTIFICATION OF BEARING HOUSING VIBRATIONS OF A LARGE BARREL TYPE INJECTION PUMP AND THEIR ANALYSIS BY MEANS OF THE FINITE ELEMENT METHOD . . .	1
<i>Wolfram Lienau, Peter Sandford, Yasar Deger</i>	
IMPELLER RERATE TO REDUCE HYDRAULICALLY GENERATED VIBRATION	10
<i>Gary Dyson</i>	
DESIGNING AN ULTRA-LOW SPECIFIC SPEED CENTRIFUGAL PUMP	16
<i>Hiroshi Satoh, Kazuo Uchida, Yinchun Cao</i>	
A NEW UNIQUE HIGH PRESSURE PUMP SYSTEM	22
<i>Thomas L. Angle, James G. Shaw, Steve Cummins, Mike Turner</i>	
HARMONIC FREE MAGNETIC (FCMA) SOFT STARTERS FOR LARGE CAPACITY HIGH VOLTAGE INDUCTION AND SYNCHRONOUS MOTORS DRIVING PUMPS AND COMPRESSORS	34
<i>Prafulla Deo, Mohan N. Gowaikar</i>	
UPTHRUST PROBLEMS ON MULTISTAGE VERTICAL TURBINE PUMPS	46
<i>Donald R. Smith, Stephen Price</i>	
A VERY HIGH HEAD PUMP	58
<i>J.T. McGuire, Vahe Hayrepetian</i>	
DESIGN AND DEVELOPMENT OF ELECTRIC SUBMERSIBLE PUMPS FOR LARGE CAPACITIES	69
<i>Andreas Hosøy, Sigve Gjerstad, Jostein Smaamo, Erik Torbergsen</i>	
ACTIVE LIFT SEAL TECHNOLOGY IMPACTED ON WATER INJECTION SERVICES	77
<i>John L. Morton, Joe Attard, John G. Evans</i>	
OPTIMIZING THE ASSET MANAGEMENT OF PUMPS THROUGH INTEGRATED ONLINE MONITORING	85
<i>Deane Horn, Mark Granger</i>	
CENTRIFUGAL PUMP COOLING AND LUBRICANT APPLICATION— A “BEST TECHNOLOGY” UPDATE	92
<i>Heinz P. Bloch</i>	
IMPROVEMENTS IN BEARING LIFE USING NEW SEALING TECHNOLOGY	103
<i>Chris Rehmann</i>	
SPECIAL PAPERS	
USE OF INDUCERS IN LIQUIFIED PETROLEUM GAS AND CONDENSATE SERVICE FOR BETTER PERFORMANCE	112
<i>Trinath Sahoo</i>	
A NEW CONCEPT IN MECHANICAL SEAL COOLING—THE INTEGRAL HEAT SINK	117
<i>Lyndon Scott Stephens, Matthew A. Hayden, Daryl S. Schneider</i>	

TUTORIALS

MATERIAL SELECTION FOR MECHANICAL SEALS127
Michael Huebner

BASIC PUMP ROTORDYNAMIC ANALYSIS AND SPECIFICATIONS136
William D. Marscher

PRACTICAL DESIGN AGAINST PUMP PULSATIONS137
Mark. A Corbo, Charles F. Stearns

PROCESSES AND PUMP SERVICES IN THE LNG INDUSTRY179
David A. Coyle, Vinod Patel

DISCUSSION GROUPS186

SHORT COURSES199

ADVISORY COMMITTEE205

PROFESSIONAL STAFF212

TURBOMACHINERY LABORATORY215

Preface

These Proceedings contain papers from the lectures for the Twenty-Second International Pump Users Symposium, held in Houston, Texas, February 28-March 3, 2005. The Symposium is sponsored by the Turbomachinery Laboratory, of the Texas Engineering Experiment Station, The Texas A&M University System.

The Pump Symposium was established as a forum for users and manufacturers of industrial pumps. Because of many overlapping areas of interest, the symposia are directed primarily to commercial users with the utility and petrochemical industries.

The Advisory Committee for the Twenty-Second International Pump Users Symposium and past symposia have had a continuing influence on the content and direction of the symposia. The committee is composed of recognized leaders in the commercial pump field from users and manufacturers. Based on their experience and knowledge of the field, papers are solicited and selected to address contemporary problems of interest. Their continued assistance is wholeheartedly appreciated.

Essential elements of the symposia that are not entirely covered by this proceedings include six short courses that preceded the symposium, 10 case studies, 12 discussion groups, and a product exhibit show. The short courses are: Basic Pump Hydraulics with a Minimum of Mathematics; The Relationship of Vibration to Problems in Centrifugal Pumps; Mechanical Seals—Design, Operation, and Troubleshooting; Fundamentals of Centrifugal Pump and System Interaction; Positive Displacement Pumps; and Induction Motors Design in Function of the Driven Load and Inertia.

This symposium includes a “case study” format. Presentations are made of a problem, its resolution, and the lessons learned. Persons attending the case studies receive a CD-ROM containing copies of the presentations.

The discussion groups are led by engineers with a great deal of experience in the subject areas, and they facilitate discussion from the floor. Attendees actively participate in the discussion groups, and many use this forum to get sound advice from their peers on problems of immediate importance. The discussion groups facilitate a quick transfer of information across industry boundaries.

The product exhibit show has more than 200 companies and features new products, accessories, and analysis tools. This aspect of the symposium has continued to improve over the past several years in the quality and range of products exhibited.

Again, the vigorous support of the Advisory Committee is appreciated. My very considerable thanks are also extended to lecture authors, short course speakers, tutorial leaders, case study presenters, and discussion leaders. Both personally, and on behalf of the Advisory Committee, a special “thank you” is extended to the exhibiting companies and their representatives.

Finally, the efforts of the Turbomachinery Laboratory staff in seeing through the detailed execution of the symposium are greatly appreciated, with particular thanks extended to Stephen Phillips. With regard to this proceedings, my personal thanks is extended to Joanne Burnett for her excellent work in editing, preparation, and organization.

Dara W. Childs, Ph.D., P.E.
Director, Turbomachinery Laboratory
Chairman, Advisory Committee

The Texas A&M University System
College Station, Texas

March 2005