ASIAN NATURAL GAS — FOR A BRIGHTER '90s

Edited by
Donald L. Klass
Institute of Gas Technology
Tadahiko Ohashi
Tokyo Gas Company, Ltd.

INSTITUTE OF GAS TECHNOLOGY
CHICAGO
# TABLE OF CONTENTS

## ASIAN NATURAL GAS — FOR A BRIGHTER '90s

<table>
<thead>
<tr>
<th>Paper No.</th>
<th>WELCOME AND INTRODUCTION</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INTRODUCTORY REMARKS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D. L. Klass, Institute of Gas Technology (U.S.A), and K. Ueda, Osaka Gas Company, Ltd. (Japan)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>KEYNOTE ADDRESS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FOR A BRIGHTER '90s IN THE ASIA-PACIFIC REGION</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>K. Anzai, Tokyo Gas Company, Ltd. (Japan)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THE FUTURE OF ASIAN NATURAL GAS — THE PETRONAS PERSPECTIVE</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Tan Sri Azizan, PETRONAS (Malaysia)</td>
<td></td>
</tr>
</tbody>
</table>

## ASIAN NATURAL GAS MARKETS

1. ASIAN GAS AND OIL SUPPLIES, PRODUCTION, AND UTILIZATION | 19 |
   J. P. Jonchere, BEICIP (France) |

2. THE END OF SURPLUS AND A GROWING ROLE IN WORLD MARKETS | 45 |
   W. D. Eklof, Cambridge Energy Research Associates (U.S.A.) |

3. PROSPECTS FOR NATURAL GAS IN THE ASIA-PACIFIC REGION | 69 |
   T. Ohashi, Tokyo Gas Company, Ltd. (Japan) |

4. NATURAL GAS PRICING IN THAILAND | 85 |
   V. Mavichak, Petroleum Authority of Thailand (Thailand) |

5. FOSSIL FUEL USAGE AND THE ENVIRONMENT | 91 |
   D. L. Klass, Institute of Gas Technology (U.S.A.) |

## FINANCING NATURAL GAS PROJECTS

6. GAS IN THE DEVELOPING WORLD — THE ROLE OF THE WORLD BANK | 123 |
   A. K. Malhotra, The World Bank (U.S.A.) |

7. THE ROLE OF THE INDUSTRIAL BANK OF JAPAN IN FINANCING GAS PROJECTS | 165 |
   Y. Kajiwara, The Industrial Bank of Japan, Ltd. (Japan) |

8. THE ASIAN DEVELOPMENT BANK'S PAST AND FUTURE INVOLVEMENT IN FINANCING GAS PROJECTS IN DEVELOPING MEMBER COUNTRIES OF THE BANK | 173 |
   S. B. Chua, Asian Development Bank (Philippines) |

9. THE MALAYSIA LNG EXPERIENCE | 185 |
   M. Muhammad, Malaysia LNG Sdn Bhd (Malaysia) |

10. FINANCIAL STRUCTURE OF KOREA GAS CORPORATION'S LNG PROJECTS | 195 |
    J. S. Ko, Korea Gas Corporation (Republic of Korea) |

11. FINANCING OF GAS PRODUCTION EXPANSION AT TAIPO | 223 |
    R. T. H. Chan, The Hong Kong and China Gas Company, Ltd. (Hong Kong) |
NATURAL GAS UTILIZATION — ELECTRIC POWER PRODUCTION

12. FUEL CELLS FOR SMALL- AND MEDIUM-SCALE ELECTRIC POWER PRODUCTION
   F. C. Schora, M-C Power Corporation (U.S.A.)
   231

13. COGENERATION BY INDUSTRY
   J. E. Baister, Mission Energy Company, F. G. Kovacevic and E. R. Skov,
   Ebasco Services Incorporated (U.S.A.)
   247

14. SMALL- AND MEDIUM-SCALE GAS COGENERATION FOR INDUSTRIES
    AND COMMERCIAL BUILDINGS IN JAPAN
   K. Kikuchi, Tokyo Gas Company, Ltd. (Japan)
   273

15. WATSON COGENERATION PROJECT: A CASE HISTORY
   J. C. Hennforth, Mission Energy Company (U.S.A.)
   289

16. COMBINED CYCLE AND STEAM INJECTED GAS TURBINES FOR
    UTILITY AND INDUSTRIAL POWER GENERATION
   A. C. K. Lin, General Electric Company (Hong Kong)
   299

17. COFIRING OF NATURAL GAS IN STEAM GENERATORS AT
    TATA'S TROMBAY THERMAL POWER STATION
   O. K. Muthappa, TATA Consulting Engineers (India)
   327

18. INDUSTRIAL AND MUNICIPAL COFIRING OF MUNICIPAL SOLID
    WASTES AND NATURAL GAS FOR DISPOSAL, EMISSIONS CONTROL,
    AND POWER PRODUCTION
   H. A. Abbasi and M. J. Khinkis, Institute of Gas Technology, D. G. Linz,
   Gas Research Institute, C. A. Peterson and F. J. Zone, Riley Stoker
   Corporation , and Y. Wakamura, Itoh Takuma Resource Systems (U.S.A.)
   351

19. MALAYSIA'S OIL-TO-GAS POWER PLANT CONVERSION PROGRAM
   H. Salleh, PETRONAS (Malaysia)
   371

20. COMPARATIVE ECONOMIC ANALYSIS OF ELECTRIC POWER
    GENERATION WITH NATURAL GAS AND OTHER FUELS
   G. Ramachandran, Electric Power Research Institute (U.S.A.)
   387

NATURAL GAS UTILIZATION — SPACE CONDITIONING, IRON PRODUCTION, AND MARKETING

21. RESIDENTIAL COOLING VIA SINGLE-EFFECT COOLING SYSTEMS
   H. J. Barkley, The Dometic Corporation (U.S.A.)
   421

22. NATURAL GAS UTILIZATION FOR AIR CONDITIONING
   H. Kawamoto, Osaka Gas Company, Ltd. (Japan)
   431

23. GAS-FIRED HEAT PUMPS
   J. Wurm and K. Kountz, Institute of Gas Technology (U.S.A.)
   443

24. COMPARATIVE ECONOMIC ANALYSES OF GAS-BASED AND ELECTRIC
    AIR CONDITIONING FOR THE COMMERCIAL SECTOR
   R. F. Patel, Arthur D. Little, Inc., and J. R. Brodrick,
   Gas Research Institute (U.S.A.)
   477

25. NATURAL GAS UTILIZATION FOR INDUSTRIAL HEAT
   S. Shimizu, Osaka Gas Company, Ltd. (Japan)
   499

26. NATURAL GAS-BASED INDIAN SPONGE IRON OF 1990s — AN EMERGING
    EMERALD RADIANCE OF THE INDIAN "SUNRISE" INDUSTRIES
   B. K. Bose and A. Bhattacharya, Oil & Natural Gas Commission, Dehra
   Dun (India)
   523
NATURAL GAS UTILIZATION — SPACE CONDITIONING, IRON PRODUCTION, AND MARKETING (Cont.)

27. COMMERCIAL-INDUSTRIAL MARKETING PROFESSIONALS FOR GAS MARKETS
   W. E. Vavrik, Institute of Gas Technology (U.S.A.) 555

28. THE IGT INTERACTIVE GAS INDUSTRY DATABASE AND INFORMATION DELIVERY SYSTEM — gasLine® AND IGTnet®
   J. Kruse, Institute of Gas Technology (U.S.A.) 563

29. APPLICATION OF INFORMATION TECHNOLOGY IN THE GAS INDUSTRY
   H. Watanabe, Tokyo Gas Company, Ltd. (Japan) 571