

CONTENTS

Preface	<i>page vii</i>
1. Oil-sealed Rotary Pumps	
1. Introduction	1
2. Mechanical designs and arrangements of single-stage pumps	1
3. General operational characteristics of single-stage pumps	8
4. Two-stage pumps	11
5. Driving oil-sealed rotary pumps	14
6. Oil suck-back and anti-suck-back devices	16
7. Vapour pumping with oil-sealed rotary pumps	19
8. Further discussion of vapour pumping characteristics of gas ballast pumps	27
9. Some accessories, special fluids and special arrangements	32
10. Two-stage combinations of single-stage pumps	41
2. Oil and Mercury Vapour Diffusion Pumps	
1. Introduction	44
2. General principles of operation	45
3. Mercury diffusion pumps	55
4. Oil diffusion pumps	65
5. Accessories for oil and mercury diffusion pumps	87
6. Typical pumping systems employing diffusion pumps	107
7. Some common operational troubles	125
3. Oil Vapour Boosters and Ejectors	
1. Introduction	132
2. General description	133
3. Performance characteristics	136
4. Accessories and safety devices	138
5. Pumping systems and applications	140
6. Some aspects of maintenance	143
7. Comparison with other types	144
4. Steam Ejectors	
1. Introduction	147
2. General principles	149
3. Condensers for steam ejector use	152
4. Performance characteristics of multi-stage units and their control – multiple element units	156
5. Some examples of ejector groups	159

6. Operational methods for multi-stage units	159
7. Operational troubles and causes of breakdown	162
8. Maintenance requirements	162
5. Mechanical Boosters (Roots Pumps)	
1. Introduction	164
2. General description	166
3. Some applications and pumping systems	178
4. Maintenance	183
5. Selection factors in relation to other types	183
6. Molecular Drag and Turbine Pumps	
1. Introduction	186
2. Molecular drag pumps	188
3. The application of axial-flow turbo-compressors for high vacuum duties	199
4. Turbo-molecular pumps	199
7. Pumping by Condensation and Freezing - Cryo-pumping	
1. Introduction	210
2. Water-cooled condensers	212
3. Refrigerated condensers for pumping water vapour	217
4. Vapour-pumping surfaces cooled with liquid nitrogen (freezing traps)	226
5. Pumping gases by 'freezing out' (cryo-pumping)	229
8. Sorbents and Desiccants as Pumping Means	
1. Introduction	252
2. Sorption pumping of general system gases	254
3. Sorption pumping of water vapour	274
9. Pumps Depending on Ionization and Gettering	
1. Introduction	284
2. Getter materials employed in getter-ion pumps	285
3. Mechanisms of gas take-up in getter-ion pumps	290
4. General descriptions of small ion and getter-ion pumps	300
5. Larger evaporation-ion pumps	310
6. Larger sputter-ion or penning pumps	324
7. Further performance characteristics of getter-ion pumps	347
10. Some Notes on Performance Measurement	
1. Introduction	362
2. Testing of oil-sealed rotary pumps	363
3. Testing of mechanical boosters (Roots pumps)	367
4. Testing of vapour booster and diffusion pumps	368
5. Speed testing all types of pumps at very high vacuum	384

11. Pumping Load, Pumping Speed and Pump-down Time

- | | |
|--|-----|
| 1. Introduction | 387 |
| 2. Pump-down of chambers from atmospheric pressure | 388 |
| 3. Pump-down at lower pressures | 392 |
| 4. The use of out-gassing data for baked systems | 402 |
| 5. Vacuum chamber impedance, and out-gassing within the pumping system | |

Index