

## CONTENTS

	Page
<b>1. Introduction</b>	<b>1</b>
<b>2. Lubricating Oils</b>	<b>5</b>
Crude Oil	6
Refining	8
Lubricating Oil Processing	15
Alternative Processes for Lubricating Oil Manufacture	26
Additives	27
Physical and Chemical Characteristics	34
Evaluation and Performance Tests	45
<b>3. Lubricating Greases</b>	<b>59</b>
Why Greases Are Used	59
Composition of Grease	60
Manufacture of Grease	61
Grease Characteristics	64
Evaluation and Performance Tests	68
<b>4. Synthetic Lubricants</b>	<b>75</b>
Synthesized Hydrocarbons	77
Organic Esters	82
Polyglycols	84
Phosphate Esters	85
Other Synthetic Lubricating Fluids	85
<b>5. Machine Elements</b>	<b>88</b>
Types of Lubricating Films	89
Plain Bearings	100
Rolling Element Bearings	121
Slides, Guides, and Ways	132
Gears	134
Cylinders	150
Flexible Couplings	152
Drive Chains	154
Cams and Cams Followers	155
Wire Ropes	157
<b>6. Lubricant Application</b>	<b>160</b>
All Loss Methods	160
Reuse Methods	167
Other Reuse Methods	173
Centralized Application Systems	174
<b>7. Internal Combustion Engines</b>	<b>183</b>
Design and Construction Considerations	184
Fuel and Combustion Considerations	189
Operating Considerations	191
Maintenance Considerations	195
Engine Oil Characteristics	196
Oil Recommendations by field of Engine Use	205

<b>8. Stationary Gas Turbines</b>	<b>214</b>
Principles of Gas Turbines	215
Gas Turbine Applications	224
Lubrication of Gas Turbines	226
<b>9. Steam Turbines</b>	<b>232</b>
Turbine Types	234
Turbine Control Systems	238
Lubrication Requirements	241
<b>10. Hydraulic Turbines</b>	<b>253</b>
Turbine Types	254
Lubricated Parts	263
Lubricant Recommendations	270
<b>11. Nuclear Power Plants</b>	<b>271</b>
Power Reactors	271
Radiation Effects on Petroleum Products	277
Lubrication Recommendations	301
<b>12. Automotive Chassis Components</b>	<b>308</b>
Suspension and Steering Linkages	308
Steering Gear	313
Wheel Bearings	317
Brake Systems	319
Miscellaneous Components	321
<b>13. Automotive Power Transmission</b>	<b>322</b>
Clutches	323
Transmissions	325
Propeller Shafts and Universal Joints	340
Transaxles	346
Other Gear Cases	347
Automotive Gear Lubricants	349
Torque Converter and Automatic Transmission Fluids	355
Multipurpose Tractor Fluids	359
<b>14. Compressors</b>	<b>365</b>
Reciprocating Air and Gas Compressors	366
Rotary Compressors	378
Refrigeration and Air Conditioning Compressors	388
<b>15. Handling, Storing, and Dispensing Lubricants</b>	<b>395</b>
Handling	397
Storing	405
Dispensing	420
<b>16. In-Plant Handling For Lubricant Conservation</b>	<b>434</b>
Overview of In-Plant Handling	436
Product Selection	437
In-Process Handling	439
In-Process Purification	443
Purification Methods	446
Reclamation of Lubricating Oils	452
Waste Collection and Routing	454
Final Disposal	457
<b>Index</b>	<b>459</b>

