FLUID POWER LOGIC CIRCUIT DESIGN

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FLUID POWER LOGIC CIRCUIT DESIGN

ANALYSIS, DESIGN METHODS
and WORKED EXAMPLES

Peter Rohner

Royal Melbourne Institute of Technology

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Preface

Pneumatic control lends itself ideally to a vast variety of low-cost industrial automation applications and has been proven on many simple, as well as complex, machines. The binary character of most fluid power control valves enables them to be used in the same way as electronic components. It therefore follows that fluid power circuit designers should use the same design methods that have been used over the past two decades and are still used by electronic circuit designers. Logically constructed control circuits have numerous advantages over intuitively designed circuits and always lead to an optimal solution.

In order to provide a teaching aid suitable for machine designers and technicians, this book avoids using the specialised terminology often found in electronics textbooks. Also, more than 250 illustrations, circuits and charts are included in order to facilitate learning and understanding. In addition, some 35 industrial control problems of a sequential and combinational nature, for both pneumatics and hydraulics, are discussed in detail and solved.

The book is divided into four main parts: Part I familiarises the reader with fluid power components, circuit presentation methods and ancillary circuitry in modular form. Part II provides a step-by-step introduction to sequential logic circuit design, utilising the well-known Karnaugh–Veitch map for signal-flow presentation and equation minimisation; step-counter circuit design is also extensively discussed and illustrated. Part III provides insight into the mystery of combinational circuit design and the Karnaugh–Veitch map is again used, together with truth tables for circuit optimisation and problem analysis. Binary counting principles are applied to fluid power circuits in Part IV and a number of practical control problems utilising binary counters are provided. In this book Boolean algebra is confined to its use for obtaining switching expressions. There are, of course, numerous textbooks that expound the general theory of Boolean algebra and related methods, such as the Quine–McCluskey method, in much greater depth.

As a teacher, I have written this book with the needs of students in mind. Its internal structure as well as its content should provide sufficient basic theory and application for technician, higher technician and degree-level courses.

I should like to express my thanks to my colleague, Norman Walkadine, whose help was of great value. I should further like to thank the Royal Melbourne Institute of Technology for providing facilities which made this book possible. Last, but not least, I should like to thank my dear wife Heidi and my children Rahel and Michael who provided invaluable moral support while I was writing this book.

PETER ROHNER