
PREFACE

It is my pleasure, on behalf of the three authors, to write the preface for this book. The concept for this book was really born from Cliff and his vast industrial experience. He had a keen observation that most published works on cold plates mainly focused on the fundamental theory at play in the cold plates. It was the heat transfer and fluid mechanics involved that drove the discussion. After all, a liquid cold plate has the same appeal that heat exchangers do to those interested in thermodynamics, heat transfer, and fluid mechanics. It represents the perfect marriage of all three disciplines and the opportunity to apply all three.

There is little information available in literature about the design and manufacturing of these cold plates, despite the interest from academia and industry alike. As a result, we have an entire industry that has no common knowledge base, no vernacular, and no shared learning of the best practices in manufacturing cold plates at an industrial scale. Each cold plate designer is forced to learn the painful lessons that producing cold plates has to offer. Corrosion, erosion, high pressure drops, and contact voiding are but a few obstacles that one must overcome along the journey to produce a cold plate product.

Cliff's desire was to share the lessons he learned and establish a common knowledge on cold plate manufacturing. He approached Satish with the concept for the book. Together, they began to form the content of the book. The fundamental theory and some of the manufacturing issues were identified. Finally, I was approached to add the nascent industrial aspects of cold plates, specifically, microchannel based. I had worked with Cliff on a few projects during my grad school days and saw his industrial expertise first hand. Naturally, I jumped at the chance to be involved.

All of the pieces finally fell into place. As I read through a few of the preliminary concepts and ideas, I recognized almost every issue I had faced in bringing my first liquid cold plate to production at IBM. There they were—the obstacles I had spent months discovering, working around, and working through while designing and developing the product! I thought to myself that I would have loved to read this before I began my design work.

The book describes the fundamental theories involved in cold plate design as well as issues involved with the manufacturing of cold plates. Obviously, every manufacturer will have their special trade secrets and methods. However, one will find that there are more common issues than there are special ones. This is a wide field in terms of theory, technology, and application. Microchannels and microfabrication have added a recent twist to the age-old cold plates, but the fundamentals remain unchanged. One needs to produce an efficient, quality part at a reasonable cost. As this application of thermodynamics, heat transfer, and fluid mechanics continues to evolve into the future, it is our collective hope that this serves as a base of shared knowledge to improve upon.

Mark E. Steinke

On behalf of Clifford J. Hayner II, Mark Steinke and Satish G. Kandlikar