Islamic Azad University
Tehran South Branch
Graduate School

Dissertation for the Partial Fulfillment for the Degree of Master of Science

Chemical Engineering - Process Design

Subject:

Computer Aided Risk Reduction Tool (CARRT)

An Inherently Safer Approach

Advisor:

Consulting Advisor:

By:

دانشگاه آزاد اسلامی

واحد تهران جنوب

دانشکده تحصیلات تکمیلی

پایان نامه برای دریافت درجه کارشناسی ارشد**"M. Sc."**

مهندسی شیمی – طراحی فرآیند

عنوان:

ابزار کاهش ریسک بکمک کامپیوتر
(CARRT)
با نگرش طراحی ذاتا ایمن تر

استاد راهنما:

استاد مشاور:

نگارش:

ABSTRACT

The term ‘inherently safer’ implies that the process is safe by its very nature and not externally constrained to be safe by the use of add-on systems and devices, hence making it a proactive approach to process safety. It is very effective in risk reduction if applied at the beginning stages of design, leading to cost effective and timely solutions and modifications. In this thesis, after elements of risk and its management strategies are briefly discussed, Inherently Safer Design (ISD) - as well as its quantification by indices both developed non-specifically and specifically for ISD - is elaborated, in order to rank alternative processes based on their inherent safety adaptability. Considering the advantages and the shortcomings of ISD quantification indices in the literature, a new modified ISD index is proposed, covering ISD aspects of a process at conceptual design stage, which leads to better ranking in comparison with its predecessor.

Finally, in order to heuristically validate the new ISD index, the details of inherently safer analysis at conceptual design stage are illustrated by comparing three competing processes for acrylonitrile manufacture. These processes are simulated using a well-known commercial process simulator, with a program added capable of extracting the necessary data from the simulation cases to calculate new ISD index value, incorporating great flexibility and speed in risk reduction through inherently safer analysis of processes.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES