

# Contents

|   |           |
|---|-----------|
| About the author  | 4         |
| Introduction  | 5         |
| <b>1 A review on the centrifugal casting</b>                            | <b>6</b>  |
| 1.1 Rotating flows . . . . .  | 6         |
| 1.1.1 Equations of motion of non-isothermal rotating flow . . . . .     | 6         |
| 1.1.2 Typical configurations with rotating flows . . . . .              | 7         |
| 1.1.3 Horizontal vs. vertical cylinder . . . . .                        | 10        |
| 1.1.4 Inertial waves . . . . .  | 12        |
| 1.2 Horizontal centrifugal casting . . . . .                            | 13        |
| 1.2.1 The view point of R&D in the plant . . . . .                      | 15        |
| <b>2 Numerical modeling of centrifugal casting</b>                      | <b>18</b> |
| 2.1 Shallow water equations - Euler-Euler multiphase approach . . . . . | 20        |
| 2.2 Shallow water equations - approximate Riemann solver . . . . .      | 21        |
| 2.3 (Non-)hydrostatic free-surface model to model . . . . .             | 24        |
| 2.4 Air gap modeling . . . . .  | 25        |
| 2.5 Software for industry . . . . .                                     | 26        |
| <b>Conclusions</b>  | <b>29</b> |
| <b>Bibliography</b>   | <b>30</b> |
| <b>List of symbols, quantities and abbreviations</b>                    | <b>33</b> |
| <b>Abstract</b>   | <b>34</b> |