

1. Record Nr.	UNINA9910506378303321
Autore	Boulos Maher I.
Titolo	Thermal spray fundamentals : from powder to part / / Maher I. Boulos, Pierre L. Fauchais, Joachim V. R. Heberlein
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-70672-9
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (1147 pages)
Disciplina	660.283
Soggetti	Metal spraying
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Foreword -- Preface -- Preface (First Edition) -- Contents -- Part I: Basic Concepts -- Chapter 1: Introduction to Thermal Spray -- 1.1 Introduction -- 1.2 Needs for Coatings -- 1.3 Thermal Spraying -- 1.4 Classification of Thermal Spray Processes -- 1.5 Historical Evolution of Thermal Spray Technology -- 1.6 Thermal Spray Applications -- 1.7 Overview of Book Content -- References -- Chapter 2: Overview of Surface Modification Technologies -- 2.1 Introduction -- 2.2 Coating Deposited at the Atomic Level -- 2.2.1 Plating -- 2.2.1.1 Electroless Plating -- 2.2.1.2 Electroplating -- 2.2.2 Physical Vapor Deposition -- 2.2.2.1 Evaporation by Resistive Heating -- 2.2.2.2 Electron and Ion Beam Vacuum Evaporator/Coating Systems -- 2.2.2.3 Sputtering -- 2.2.2.4 Pulsed Laser Deposition -- 2.2.3 Chemical Vapor Deposition -- 2.2.3.1 Low-Pressure Chemical Vapor Deposition -- 2.2.3.2 Plasma-Enhanced Chemical Vapor Deposition -- 2.2.3.3 Laser-Enhanced Chemical Vapor Deposition -- 2.2.4 Thin Film Coating Technologies in Industry -- 2.3 Thermal-Sprayed Coatings -- 2.3.1 Basic Concepts -- 2.3.1.1 Combustion-Based Processes -- 2.3.1.2 Plasma-Based Processes -- 2.3.2 Energetic Gas Flow Generation -- 2.3.2.1 Cold Spray -- 2.3.2.2 Flame Spray -- 2.3.2.3 Plasma Spraying -- 2.3.2.4 Plasma-Transferred Arc Deposition -- 2.3.3 Material Preparation and Injection -- 2.3.3.1 Powder Injection -- 2.3.3.2 Wire, Rod, or Cord Injection -- 2.3.3.3 Liquid Injection -- 2.3.4 Substrate Preparation -- 2.3.5 Coating Formation -- 2.3.6 Residual

Stresses -- 2.3.7 Brief Descriptions of Thermal Spray Applications --
2.4 Summary and Conclusions -- Nomenclature -- Latin Alphabet --
Greek Alphabet -- References -- Chapter 3: Fundamentals of
Combustion and Thermal Plasmas -- 3.1 Introduction -- 3.2
Combustion -- 3.2.1 Description of Combustion Processes.
3.2.2 Combustion at Equilibrium -- 3.2.3 Combustion Kinetics --
3.2.3.1 One-Step Reactions -- 3.2.3.2 Simultaneous Interdependent
and Chain Reactions -- 3.2.3.3 Criterion for Explosion -- 3.2.4
Combustion (Deflagrations) or Detonations -- 3.2.4.1 Combustion
(Deflagration) -- 3.2.4.2 Detonation -- 3.3 Thermal Plasmas for
Spraying -- 3.3.1 Comparison of Thermal Plasma and Combustion
Spraying -- 3.3.2 Definition -- 3.3.3 Plasma Composition -- 3.3.4
Thermodynamic Properties -- 3.3.5 Transport Properties -- 3.3.5.1
Electrical Conductivity -- 3.3.5.2 Molecular Viscosity -- 3.3.5.3
Thermal Conductivity -- 3.4 Basic Concepts in Modeling of Plasma
Spraying Processes -- 3.4.1 Introduction -- 3.4.2 Conservation
Equations for the Modeling of Plasma Flows -- 3.4.2.1 Continuity
Equations -- 3.4.2.2 Momentum Equations -- 3.4.2.3 Energy Equations
-- 3.4.2.4 Electromagnetic Field Equations -- 3.4.2.5 Laminar or
Turbulent Flows -- 3.4.3 Gas Composition, Thermodynamic, and
Transport Properties -- 3.4.3.1 Gas Composition -- 3.4.3.2
Thermodynamic Properties -- 3.4.3.3 Transport Properties -- 3.4.4
Examples of DC Torch Modeling Results -- 3.5 Summary and
Conclusions -- Nomenclature -- Latin Alphabet -- Mathematical
Symbols -- Greek Alphabet -- References -- Chapter 4: Plasma-
Particle Momentum and Heat Transfer -- 4.1 Introduction -- 4.2
Overview of Powder Characteristics -- 4.2.1 Individual Particle Size and
Morphology -- 4.2.2 Particle Size-Distribution -- 4.3 Plasma-Particle
Momentum Transfer -- 4.3.1 Flow around Single Sphere and Drag
Coefficient -- 4.3.2 Corrections to the Drag Coefficient -- 4.3.2.1
Effect of the Temperature Gradients -- 4.3.2.2 Effect of Particle Shape
-- 4.3.2.3 Non-continuum Effect -- 4.3.2.4 Effect of Particle Charging
-- 4.4 Plasma-Particle Heat Transfer -- 4.4.1 Heat Transfer Coefficient
-- 4.4.2 Corrections to the Heat Transfer Coefficient.
4.4.2.1 Effect of the Temperature Gradients -- 4.4.2.2 Non-continuum
Effect -- 4.4.3 Radiation Energy Losses from the Surface of the Particle
-- 4.5 Transient Heating and Melting of a Particle -- 4.5.1 Spherical
Particle with Infinite Thermal Conductivity -- 4.5.2 Effect of Internal
Heat Conduction -- 4.5.3 The Moving Boundary Problem -- 4.5.4
Transient Heating and Melting of Porous Spherical Particle -- 4.6
Particle Vaporization Under Plasma Conditions -- 4.6.1 Basic
Mechanism of Particle Vaporization -- 4.6.2 Effect of Vaporization on
Heat Transfer -- 4.6.3 Effect of Radiation on Particle Vaporization --
4.6.4 Effect of Mass Transfer and Chemical Reactions -- 4.7 Chemical
Reactions and Melt Circulation -- 4.7.1 Diffusion Controlled Reaction
-- 4.7.2 Reactions Taking Place Between Condensed Phases -- 4.7.3
Reactions Controlled by Convection Within Liquid Phase -- 4.7.4 Nano-
and Micrometer-Sized Particles and Coating Structures -- 4.8 Summary
and Conclusions -- Nomenclature -- Latin Alphabet -- Greek Alphabet
-- References -- Chapter 5: Gas and Particle Dynamics in Thermal
Spray -- 5.1 Introduction -- 5.2 Particle Injection in Plasma Spray --
5.2.1 Design Considerations of Particle Injection Systems -- 5.2.2
Effect of Carrier Gas -- 5.3 Suspension or Solution Injection into Plasma
Flows -- 5.3.1 Gas Atomization -- 5.3.2 Mechanical Atomization --
5.3.2.1 Liquid Penetration into the Plasma Flow -- 5.3.2.2 Liquid
Fragmentation -- 5.3.2.3 Droplets Fragmentation and Vaporization --
5.3.2.4 Influence of Arc Root Fluctuations -- 5.3.3 Cooling of Plasma
Flow by the Liquid -- 5.4 Particles and Droplets in Combustion and

Thermal Plasmas -- 5.4.1 Flow and Temperature Fields in DC Plasma Jets -- 5.4.2 Particle Trajectories in DC Plasma Spraying -- 5.4.3 Flow and Temperature Fields in RF Induction Plasmas. 5.4.4 Particle Velocity Distributions in RF Plasma Spraying -- 5.5 Particle Trajectory and Temperature History -- 5.5.1 Model Formulation -- 5.5.2 Single Particles Motion in Combustion or Plasma Stream -- 5.5.2.1 Equations of Motion -- 5.5.2.2 In-Flight Particle Heating, Melting, and Evaporation -- 5.5.3 Particle Trajectory in Combustion and DC Plasmas -- 5.5.3.1 Influence of the Injection Conditions -- 5.5.3.2 Optimization of the Injection -- 5.5.3.3 Influence of Plasma Jet Fluctuations -- 5.5.4 Trajectory Corrections Due to Various Effects -- 5.5.4.1 Effect of Temperature Gradient -- 5.5.4.2 Effect of Rarefaction and Vaporization -- 5.5.4.3 Effect of Turbulence -- 5.5.4.4 Thermophoresis Effect -- 5.5.4.5 Other Effects -- 5.5.5 Particle Trajectory in Induction Plasmas -- 5.6 Plasma-Particle Interactions Under Dense Loading Conditions -- 5.7 Summary and Conclusions -- Nomenclature -- Latin Alphabet -- Greek Alphabet -- References -- Part II: Thermal Spray Technologies -- Chapter 6: Cold Spray -- 6.1 Introduction -- 6.2 Overview of Cold Spray Technologies -- 6.2.1 Conventional Cold Spray -- 6.2.2 Kinetic Spray -- 6.2.3 Pulsed-Gas Dynamic Spray -- 6.2.4 Low Pressure Cold Spray -- 6.2.5 Vacuum Cold Spray -- 6.2.6 Laser-Assisted Cold-Spray -- 6.3 Gas Dynamics in Cold Spray Process -- 6.3.1 Isentropic Expansion of the Flow -- 6.3.2 Compressible Flow Models -- 6.3.3 Nozzle Design -- 6.4 Coating Formation -- 6.4.1 Induction Time -- 6.4.2 Particle and Substrate Deformation -- 6.4.3 Critical Impact Velocity -- 6.4.4 Material and Substrate Compatibility -- 6.4.5 Particle Shock Consolidation -- 6.4.6 Coating Buildup -- 6.4.7 Deposition Efficiency -- 6.5 Deposition Parameters -- 6.5.1 Spray Gases -- 6.5.2 Spray Powders -- 6.5.2.1 General Remarks -- 6.5.2.2 Influence of Particle Diameter, Density, and Specific Heat -- 6.5.2.3 Particle Temperature. 6.5.2.4 Composite Materials -- 6.5.2.5 Metal-Ceramic Blends -- 6.5.2.6 Metal-Cladded Composite Particles -- 6.5.2.7 Nano Composites -- 6.5.3 Substrate -- 6.5.3.1 Substrate Roughness -- 6.5.3.2 Spray Distance -- 6.5.3.3 Spray Angle -- 6.5.3.4 Substrate Oxidation -- 6.5.3.5 Laser Preheating of the Substrate -- 6.5.4 Nozzle Design and Powder Injection -- 6.5.4.1 Carrier Gas -- 6.5.4.2 Critical Velocity -- 6.5.4.3 Particle Loading Effect -- 6.6 Coating Materials and Process Applications -- 6.6.1 General Remarks -- 6.6.2 Metals -- 6.6.2.1 Aluminum -- 6.6.2.2 Copper -- 6.6.2.3 Nickel -- 6.6.2.4 Selective Galvanizing -- 6.6.2.5 Superalloys -- 6.6.2.6 Titanium and TiO₂ and TiN -- 6.6.2.7 Iron and Steel -- 6.6.2.8 Tantalum -- 6.6.2.9 Pure Silicon -- 6.6.2.10 Pure Silver -- 6.6.2.11 Metallic Coatings on Polymers -- 6.6.2.12 Complex Alloys -- 6.6.2.13 Submicronic Ceramic Powders -- 6.6.3 Composites -- 6.6.3.1 Pure Iron (99.5%) or Stainless Steel (304 L) Reinforced by Diamond -- 6.6.3.2 Aluminum and Copper -- 6.6.3.3 Aluminum and Silicon -- 6.6.3.4 Fabrication of Cermets Coatings -- 6.6.3.5 Fe-Al Inter-Metallic Compounds -- 6.6.3.6 Cermets -- 6.6.3.7 Ceramics -- 6.7 Immerging Technologies and Applications of Cold Spray -- 6.7.1 Low Pressure Cold Spray (LPCS) -- 6.7.2 Additive Manufacturing -- 6.8 Summary and Conclusions -- Nomenclature -- Latin Alphabet -- Greek Alphabet -- References -- Chapter 7: Combustion Spraying -- 7.1 Overview of Combustion-Based Spray Technologies -- 7.2 Flame Spraying -- 7.2.1 Basic Concepts -- 7.2.2 Powder Flame Spraying -- 7.2.2.1 Spray Gun Design and Process Characteristics -- 7.2.2.2 Applications -- 7.2.3 Solution Flame Spraying (SFS) -- 7.2.4 Wire, Rod, and Cord Spraying -- 7.2.4.1 Spray Gun Design and Process Characteristics -- 7.2.4.2 Applications -- 7.3

2. Record Nr.	UNINA9911006701203321
Autore	Gers Juan M
Titolo	Protection of Electricity Distribution Networks
Pubbl/distr/stampa	Stevenage : , : Institution of Engineering & Technology, , 2022 ©2022
ISBN	1-83724-570-3 1-5231-4232-4 1-83953-271-8
Edizione	[4th ed.]
Descrizione fisica	1 online resource (548 pages)
Collana	Energy Engineering
Altri autori (Persone)	HolmesEdward
Disciplina	621.319
Soggetti	Electric power distribution
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Title -- Copyright -- Contents -- About the authors -- Preface and acknowledgements -- Preface to second edition -- Preface to third edition -- 1 Introduction -- 1.1 General -- 1.2 Basic principles of electrical systems -- 1.3 Protection requirements -- 1.4 Protection zones -- 1.5 Primary and backup protection -- 1.5.1 Primary protection -- 1.5.2 Backup protection -- 1.6 Directional protection -- 1.7 Relay models -- 1.8 Adaptive protection -- 2 Calculation of short circuit currents -- 2.1 Modelling for short circuit current calculations -- 2.1.1 Effect of the system impedance -- 2.1.2 Effect of rotating machinery -- 2.1.3 Types of fault duty -- 2.1.4 Calculation of fault duty values -- 2.2 Fault calculation for symmetrical faults -- 2.3 Symmetrical components -- 2.3.1 Importance and construction of sequence networks -- 2.3.2 Calculation of asymmetrical faults using symmetrical components -- 2.3.3 Equivalent impedances for a power system -- 2.4 Supplying the current and voltage signals to protection systems -- 2.5 General considerations of fault currents from DERs -- 2.6 Analysis tools for short circuit current calculation -- 3 Classification and function of relays -- 3.1 Classification -- 3.1.1

Construction -- 3.1.2 Incoming signal -- 3.1.3 Function -- 3.1.4
International identification of electrical devices -- 3.2
Electromechanical relays -- 3.2.1 Attraction relays -- 3.2.2 Relays with
moveable coils -- 3.2.3 Induction relays -- 3.3 Evolution of protection
relays -- 3.4 Numerical protection -- 3.4.1 General -- 3.4.2
Characteristics of numerical relays -- 3.4.3 Typical architectures of
numerical relays -- 3.4.4 Standard functions of numerical relays -- 3.5
Supplies to the relay circuits -- 4 Current and voltage transformers --
4.1 Voltage transformers -- 4.1.1 Equivalent circuit -- 4.1.2 Errors --
4.1.3 Burden -- 4.1.4 Selection of VTs.
4.1.5 Capacitor VTs -- 4.2 Current transformers -- 4.2.1 Equivalent
circuit -- 4.2.2 Errors -- 4.2.3 AC saturation -- 4.2.4 Burden -- 4.2.5
Selection of CTs -- 4.2.6 Accuracy classes established by the ANSI
standards -- 4.2.7 DC saturation -- 4.2.8 Precautions when working
with CTs -- 5 Overcurrent protection -- 5.1 General -- 5.2 Types of
overcurrent relay -- 5.2.1 Definite-current relays -- 5.2.2 Definite-
time/current or definite-time relay -- 5.2.3 Inverse-time relays -- 5.3
Setting overcurrent relays -- 5.3.1 Setting instantaneous units -- 5.3.2
Coverage of instantaneous units protecting lines between substations
-- 5.3.3 Setting the parameters of time-delay overcurrent relays -- 5.4
Constraints of relay coordination -- 5.4.1 Minimum short circuit levels
-- 5.4.2 Thermal limits -- 5.4.3 Pickup values -- 5.5 Coordination
across Dy transformers -- 5.5.1 Three-phase fault -- 5.5.2 Phase-to-
phase fault -- 5.5.3 Phase-to-earth fault -- 5.6 Coordination with
fuses -- 5.7 Coordination of negative-sequence units -- 5.8
Overcurrent relays with voltage control -- 5.9 Setting overcurrent
relays using software techniques -- 5.10 Use of digital logic in
numerical relaying -- 5.10.1 General -- 5.10.2 Principles of digital
logic -- 5.10.3 Logic schemes -- 5.11 Adaptive protection with group
settings change -- 5.12 Exercises -- 6 Fuses, reclosers and
sectionalisers -- 6.1 Equipment -- 6.1.1 Reclosers -- 6.1.2
Sectionalisers -- 6.1.3 Fuses -- 6.2 Criteria for coordination of
time/current devices in distribution systems -- 6.2.1 Fuse-fuse
coordination -- 6.2.2 Recloser-fuse coordination -- 6.2.3 Recloser-
recloser coordination -- 6.2.4 Recloser-relay coordination -- 6.2.5
Recloser-sectionaliser coordination -- 6.2.6 Recloser-sectionaliser-
fuse coordination -- 6.2.7 Current-limiting fuses.
6.3 Criteria for coordination of time/current devices under automated
feeder reconfiguration -- 6.4 Criteria for coordination of time/current
devices with DG intermittent sources -- 7 Directional overcurrent relays
-- 7.1 Construction -- 7.2 Principle of operation -- 7.3 Relay
connections -- 7.3.1 30° Connection (0° AMT) -- 7.3.2 60° Connection
(0° AMT) -- 7.3.3 90° Connection (30° AMT) -- 7.3.4 90° Connection
(45° AMT) -- 7.4 Directional earth-fault relays -- 7.5 Coordination of
instantaneous units -- 7.6 Setting of time-delay directional overcurrent
units -- 7.6.1 Pickup setting -- 7.6.2 Time dial setting -- 7.7
Importance of the directional protection -- 7.8 Exercises -- 8
Differential protection -- 8.1 General -- 8.2 Classification of
differential protection -- 8.3 Transformer differential protection --
8.3.1 Basic considerations -- 8.3.2 Selection and connection of CTs --
8.3.3 Inrush restraint -- 8.3.4 Percentage of winding protected by the
differential relay during an earth fault -- 8.3.5 Determination of the
slope -- 8.3.6 Distribution of fault current in power transformers --
8.3.7 Dual slope setting -- 8.3.8 Overexcitation (V/Hz) -- 8.3.9 High
setting (this defeats the differential protection) -- 8.4 Differential
protection for generators and rotating machines -- 8.5 Line differential
protection -- 8.6 Busbar differential protection -- 8.6.1 Differential
system with multiple restraint -- 8.6.2 High-impedance differential

system -- 8.7 Exercises -- 9 Distance protection -- 9.1 General -- 9.2 Types of distance relays -- 9.2.1 Impedance relay -- 9.2.2 Directional relay -- 9.2.3 Reactance relay -- 9.2.4 Mho relay -- 9.2.5 Completely polarised mho relay -- 9.2.6 Relays with lens characteristics -- 9.2.7 Relays with polygonal characteristics -- 9.2.8 Relays with combined characteristics -- 9.3 Setting the reach and operating time of distance relays.

9.4 The effect of infeeds on distance relays -- 9.5 The effect of arc resistance on distance protection -- 9.6 Residual compensation -- 9.7 Impedances seen by distance relays -- 9.7.1 Phase units -- 9.7.2 Earth-fault units -- 9.8 Power system oscillations -- 9.9 The effective cover of distance relays -- 9.10 Maximum load check -- 9.10.1 Mho relays -- 9.10.2 Relays with a polygonal characteristic -- 9.11 Drawing relay settings -- 9.11.1 Starting unit settings -- 9.11.2 Residual compensation constant setting -- 9.11.3 Time setting -- 9.11.4 Load check -- 9.11.5 Determination of the effective cover -- 9.12 Intertripping schemes -- 9.12.1 Underreach with direct tripping -- 9.12.2 Permissive underreach intertripping -- 9.12.3 Permissive overreach intertripping -- 9.13 Distance relays on series-compensated lines -- 9.14 Technical considerations of distance protection in tee circuits -- 9.14.1 Tee connection with infeeds at two terminals -- 9.14.2 Tee connection with infeeds at all three terminals -- 9.15 Use of distance relays for the detection of the loss of excitation in generators -- 9.16 Exercises -- 10 Protection of low-voltage systems -- 10.1 Protection devices -- 10.1.1 Overcurrent relays -- 10.1.2 Direct-acting devices in power breakers and MCCBs -- 10.1.3 Combined thermal relay contactor and fuse -- 10.1.4 MCCBs with numerical protection -- 10.2 Criteria for setting overcurrent protection devices associated with motors -- 10.2.1 Thermal relays -- 10.2.2 Low-voltage breakers -- 10.3 Arc flash -- 10.3.1 Arc flash calculation methods -- 10.3.2 Arc flash and approach boundary -- 10.3.3 Hazard study methodology -- 10.3.4 Electrode configurations -- 10.3.5 Selection of PPE -- 10.3.6 Arc thermal performance value -- 10.3.7 Energy break-open threshold -- 10.3.8 DC arc flash calculations -- 11 Industrial plant load shedding.

11.1 Power system operation after loss of generation -- 11.2 Design of an automatic load shedding system -- 11.2.1 Simple machine model -- 11.2.2 Considerations of implementing a load shedding system -- 11.3 Criteria for setting frequency relays -- 11.3.1 Operating times -- 11.3.2 Determination of the frequency variation -- 11.4 Example of calculating and setting frequency relays in an industrial plant -- 11.4.1 Calculation of overload -- 11.4.2 Load to be shed -- 11.4.3 Frequency levels -- 11.4.4 Load shedding stages -- 11.4.5 Determination of the frequency relay settings -- 11.4.6 Verification of operation -- 11.5 Load shedding using logic schemes -- 12 Protection schemes and substation design diagrams -- 12.1 Protection schemes -- 12.1.1 Generator protection -- 12.1.2 Motor protection -- 12.1.3 Transformer protection -- 12.1.4 Line protection -- 12.2 Types of substations -- 12.3 Substation design diagrams -- 12.3.1 Single-line diagrams -- 12.3.2 Substation layout diagrams -- 12.3.3 Diagrams of AC connections -- 12.3.4 Diagrams of DC connections -- 12.3.5 Wiring diagrams -- 12.3.6 Digital substations -- 12.3.7 Logic diagrams -- 12.3.8 Cabling lists -- 13 Communication networks for power systems automation -- 13.1 IEC 61850 overview -- 13.2 Standard documents and features of IEC 61850 -- 13.3 System Configuration Language -- 13.4 Challenges facing the testing of IEC 61850 devices -- 13.5 Configuration and verification of GOOSE messages -- 13.5.1 Configuration of the system -- 13.5.2 System verification test -- 13.6

Substation IT network -- 13.7 Process bus -- 14 Installation, testing and maintenance of protection systems -- 14.1 Installation of protection equipment -- 14.2 Testing protection schemes -- 14.2.1 Factory acceptance test -- 14.2.2 Commissioning tests -- 14.2.3 Maintenance test -- 14.2.4 Troubleshooting.
14.3 Commissioning numerical protection.

Sommario/riassunto

This book provides an overview of most aspects of electrical protections. The emphasis is on distribution systems, but protection of generation and transmission systems are also treated. For this 4th edition, new topics are added, such as protection of renewable power plants and transient stability analysis.
