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HOT-DIP GALVANIZING
2-8-54-1

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HOT-DIP GALVANIZING

Compiled By
Texas Transportation Institute

1. "Corrosion Prevention by Hot-Dip Galvanizing" W. L. Hall, Corrosion Technology v 10 n 7 July 1963, p 173-5, 182.

   General discussion of galvanizing process and equipment, typical applications and performance of galvanized coatings.

2. "Hot-Dip Galvanizing" J. R. Hall, Matls Protection v 1 n 11 Nov 1962 p 28-30, 32

   General advantages of hot dip galvanizing are discussed to show its effectiveness in protecting steel surfaces from corrosion; economics of galvanizing in relation to other types of coatings; case histories given concern galvanized beams, pipe columns and support bracket in chemical plant, and highway light poles.

3. "Improvement in Zinc Coating" E. L. Knapp, Wire & Wire Products, v 38, n 7 July 1963, p 953-4, 956-7.

   New method of applying heavy zinc coating by hot dip process to carbon steel grade wire strands is described; details of fabrication of this zinc covered product into barb wire, and farm and right-of-way fence.

4. "Useful Properties of Galvanized Steel Sheets" E. P. Beachum, Blast Furnace & Steel Plant v 3, 5 Mar 1963, p 210-21, May, p 368,72.

   Mar. Types of hot dip galvanizing; control of coating characteristics; coating weight and corrosion; mechanical properties of coated sheets; requirements for usefulness. May. Commercial quality and drawing quality applications, outstanding advantage of continuously galvanized sheets where minimum strength levels are required.

5. "Hot-Dip Galvanizing with Less Common Bath Additions" J. J. Sebisty, R. H. Palmer, Canada, Dept Mines & Tech Surveys-Mines Branch-Research Report 125, Feb. 1964, 40 p.

   Galvanized coating formation in "aluminum-free" and "aluminum-containing" baths alloyed with individual additions of elements not normally encountered in commercial galvanizing practice; additions of Cr, Co, Mg, Mn, Ni, Ag, Ti, V and Zr were generally retained without difficulty, at or near nominal concentrations tried in experimental flux-free baths; none of elements gave indications of commercial promise when combined with aluminum and lead at concentrations applicable to continuous strip galvanizing practice. 14 refs.

6. "Magnesium Increases Corrosion Resistance of Hot-Dip Galvanizing" L. M. Vaught, C. R. Schrieber, Matls Protection v 3 n 3 Mar 1964, p 48-50, 52-3.

First and second phases of 3-pt study to determine effect of Mg additions to galvanizing baths are reviewed; based upon completed work, it is concluded that 01014-0.8% Mg substantially improved corrosion resistance of galvanized steel in flowing sea water and in severe industrial-marine atmospheres; presence of Mg perceptibly retards iron discoloration of exterior zinc layer; investigations continue on development of practical hot dip galvanizing operation with Mg addition.

7. "Advantages of Direct-Fired Heating in Continuous Strip Galvanizing" C. A. Turner, Iron & Steel Engr v 41, n 3 Mar 1964, p 107-13.

Selas Corp of America direct heating galvanizing lines differ radically from other type lines in that strip entering furnace is directly exposed to gaseous products of combustion; description of lines covers in-line annealing, batch annealed coils and all-purpose line; advantages include ability to produce coated strip forany forming requirement, compact equipment, reduced floor space, no flux requirement, compact equipment, reduced floor space, no flux requirement, no prepared atmosphere, no explosion hazard, low operating and maintenance costs and rapid removal of furnace from strip line to avoid overheating of strip with stoppages, or to facilitate threading.

8. "The Lizotte Bridge" - A Review and Discusiion of "The Case For Galvanized Bridges", J. R. Hall, Paper presented at the 44th Annual Meeting of the Highway Research Board, 1964, vol. 34 n 12, p 35.

A discussion of the galvanization of the first conventional bridge in the world included topics such as size of members, investigation of warpage, acid entrapment, effects on ductility and notch toughness, and slip resistance of galvanized surfaces using high tensil bolts throughout the structure. Mention is made of current state highway programs in galvanizing. Cost figures for galvanizing as opposed to painting thickness of coating, problems in design, and expected maintenance-free life of the coating under existing conditions are given.

9. "Corrosion Tests on Metallized Coated Steel - 10 Year Report" American Welding Society, Committee on Metallizing. Welding Journal Vol. 44, no. 7, pp 565-570, July 1965.

The results of a 10-yr inspection of metallized coated steel panels indicate significantly the corrosion protection life of some types and thicknesses of metalized coatings under numerous environments conditions. All aluminum coatings, sealed or unsealed, in all environments are still providing the stool with adequate protection against corrosion. The majority of 0.008-in. thick zinc coatings exposed to the atmosphere have failed as have 0.003-, 0.006-in. and 0.009-in. thick zinc coatings which were exposed to sea water immersion environments.

10. "Fighting Corrosion With Zinc Plus Paint" E. A. Anderson, Canadian Paint and Varnish 1962, 36 (9), 96-100, 137-40. Building Science Abstracts, Vol. 36, No. 8, p 228, Aug. 1963.

    Both zinc and paint have been used separately to provide steel with the required corrosion protection. It is shown that the best durability is obtained when new galvanized steel is painted. This system is also least expensive when costs are calculated on a per-year-of-protection basis. After 10 years the system of painting newly galvanized steel is cheaper than painting black iron, and after 18 years is cheaper than allowing the galvanized surface to start rusting before painting. Due to possible breaks in the organic film it is necessary to use the normal thickness of zinc since a 1-mil film only lasts about 4.5 years in an industrial area. The use of phosphating wash primers, and zinc dust-zinc oxide paints to obtain adhesion to a freshly galvanized surface is discussed.

11. "A Major Guide Rail Galvanizing Program" The decision arrived at by the New York State Thruway Authority to galvanize some 275 miles of beam-type guide railing was based on the inability to find one type of surface protection which could reasonably and economically compete with zinc.

    The mechanical details of removing the rails, getting them to the galvanizing plant and reinstalling them are described, as well as the galvanizing process and inspection routines. The complete program will require three years for completion at an estimated cost of $1,016,000.

    John A. Robertson, Public Works, Vol 95, No. 10, pp 114-117, Oct. 1964.

12. "Useful Properties of Galvanized Steel Sheets" E. P. Beachum, Plast Furnace & Steel Plant v 3, 5 Mar 1963, p 210-21, May p 368-72.

    Mar. Types of hot galvanizing; control of coating characteristics; coating weight and corrosion; mechanical properties of coated sheets; requirements for usefulness. May. Commercial quality and drawing quality applications, outstanding advantage of continuously galvanized sheets where minimum strength levels are required.

13. "Study of Influence of Various Intermetallic Iron-Zinc Layers on Rates of Attack of Solid Iron by Liquid Zinc" C. Allen, J. Mack-Owiak, Corrosion Science v 3 n 2 June 1963, p 87-97, 6 plates.

    Reaction of solid iron with liquid zinc, which may be regarded as corrosion reaction, is of practical importance in galvanizing industry; it also provides system for studying some fundamental aspects of corrosion reactions involving liquid metals; new tech-

nique was devised in order to assess relative protective properties of various intermetallic layers when exposed to attack of molten zinc; this method has shown that absence of zeta phase above 495 C and anisotropic nature of delta 1 phase is responsible for change in rate of attack from parabolic to linear.

14. "Neues Verfahren zum Verzinken von Stahldraht" M. R. Lourdin, Draht v 14, n 3 Mar. 1963, p 116-18.

Hot-dip galvanizing steel wire; summary of process and equipment developed jointly by Heurty and Siderol companies of France; description of semi-industrial plant at Marnaval for continuous galvanizing of 0.8-4 mm wire; advantage of new process is that iron zinc layer is only 3 µm thick.

15. "Galvanizing (Hot-Dip)" H. Bablik, translated by C. A. Bentley, 3 ed. E & F N Spon,Ltd, London 1950. 502 p, illus., diagrs., charts tables, 70s.

Chracteristics of scale, pickling theory and practice, and fluxes; detailed treatment of galvanizing theory and practice. Eng Soc Lib, NY.

16. "Hot-Dip Galvanizing of Cold-Rolled Strip" H. Bablik, F. Goetzl and R. Kukaczka, Metal Industry v 79, n 12, Sept 21, 1951, p 242-3

Factors necessitating special treatment for cold rolled strips; disturbance of surface during cold rolling; removal of disturbed surface layer by acid pickling or electrolytic process; zinc intake after its removal; trouble free galvanizing of cold rolled strips or sheets can be only achieved by first removing disturbed layer.

17. "Hot-Dip Galvanizing of Powder Iron Compacts" H. Bablike, F. Goetzl and R. Kukaczka, Metal Industry v 79 n 12 Sept. 21, 1951, p 241-3.

Report on experiments carried out in Germany; special structure and surface development of powder iron considered instrumental in causing increased reaction and unusual structure of reaction layers; effect of dipping temperature on powder iron; it is concluded that, in relation to corrosion, hot dip galvanized powder iron is to be considered equal to hot dip galvanized rolled iron.

18. "Modern Hot-Dip Galvanizing", R. F. Ledfore, Products Finishing v 16 n 1 Oct. 1951, p 26-30

Formation of dross; its causes such as carryover of iron salts on work being processed; etc.; importance of careful preparation of work for galvanizing stressed; treatment cycle; stability of zinc ammonium chloride flux washes and iron removal; relation of pH to purification.

19. "Modern Practice in Hot Dip Galvanizing" R. W. Bailey, Electroplating v 4 n 9 Sept. 1951, p 277-80.

When hot dip galvanizing is used and temperatures at which it is done; dross forming; progress made in hot dip galvanizing; Sendzimir process described.

20. "Battle Against Corrosion" R. H. Wilcox, Mill & Factory v 51 n 2, 4, 3 August 1952, p 85-7, Sept p 97-100, Oct. p 115-8.

Aug: Corrosion mechanisms and types; protective measures; coatings and linings, cathodic protection, and modification of environment. Sept: Surface preparation; pickling, blasting, and solvent degreasing metallic coatins; zinc, nickel chromium, tin, cadminum, lead, and aluminum hot dip process, electrolytic coating, cementation, vaccum metallizing, spraying, and cladding. Oct: Cathodic protection; applications.

21. "Hot-Dip Galvanizing of Structural Steel Sections" R. A. Painter Instn Elec Engrs-Proc v 99 pt 2 (Power Eng) n 67 Feb. 1952, p 39-47.

General method of protecting transmission structures against corrosion is hot dip galvanizing; description of metallurgical construction of zinc coat, together with some information on its expected life, and description of process, certain methods of quality control and advise on care of finished product.

22. "Proper Heat Applied to Galvanizing Pot Gives Good Coating, Long Pot Life, Fast Production" M. Mysell, Western Metals v 10 n 8, Aug 1952, p 46-8.

Impact burner type of furnace employed; importance of close control of temperature of molten zinc; pot life of four to six years expected with new installation.

23. "Protective Coatings on Metals" D. M. Dovey, K. C. Randle, Metal Treatment & Drop Forging v 20 n 95 Aug 1953 p 341-5.

Solid and liquid phase methods for application of coatings; development of vapor deposition process which is limited to materials for moderate temperature service; types of ceramic coatings and their application; cladding, sintering and hot dipping; future development. Bibliography.

24. "Zinc Economy Trials in Industrial Hot-Dip Galvanizing Plant" D. N. Fagg, N. B. Rutherford, Sheet Metal Industries v 29 n 308, Dec. 1952, p 1117-25.

Report of work trials by British Non-Ferrous Metals Research Assn stating possibility of saving 27% of former zinc consumption of plant; former practice and modification including production of thinner and more uniform coatings and reduction in formation of residuals; method recommended for treatment of zinc ashes.

25. "Controlled Hot Dip Galvanizing" K. S. Frazier, Steel v 134, n 8, 9, 10, Feb. 22, 1954 p 102-3, Mar 1, p 98-9, Mar 8, p 138-9.

Effect of length of submersion on quality of zinc coating; tests show that beyond 5 min there is decided increase in tramp particles and formation of dross; control of dross formation; base materials discussed; factors to consider in fabrication of materials for galvanizing.

26. "Observations on Loss of Aluminum from Galvanizing Baths" N. B. Rutherford, Metal Treatment & Drop Forging v 21 n 105 June 1954. p 261-7.

Losses of aluminum during galvanizing by reaction with molten fluxes during controlled agitation; means for reducing loss and method of calculating additions needed; small aluminum additions needed; small aluminum additions are commonly made to baths to improve appearance and properties of coated products. Bibliography.

27. "Electroplating Prior to Hot Galvanizing for Improved Results" A. T. Baldwin, Metal Progress v 65 n 6 Dec. 1953, p 76-81.

Experiments by; Hanson-Van Winkle-Munning Co., Matawan, NJ, to determine if very thin electroplated films would be useful in carrying out hot galvanizing operation; results of galvanizing steel panels at 850 F after preplating them with zinc, tin, nickel and iron films; it is concluded that electroplated films improve process.

28. "Work of B.I.S.R.A. Coatings Research Laboratory at Sketty Hall, Swansea" S. S. Carlisle, Metal Finishing J v 1 No. 4 Apr 1955 p 159-65.

Projects in laboratory of British Iron & Steel Research Assn; iron zinc alloy coating on steel; corrosion of tin plate by fruit packs; hot dip aluminized steel; recovery of zinc from galvanizers' dross; recovery of sulphuric acid from waste pickle liquor; continuous hot tinning of steel strip; study of surface conditions and coating quality.

29. "Hot Dip Galvanizing is Science" W. G. Imhoff, Wire & Wire Products v 30 n 2, 3, 4, 5 6, 7 Feb. 1955, p 167-70, 233-5, Mar p 295-7 Apr p 437-9, 487-90, May p 553-6, 605, June p 681-3, 726-7, July p 787-9, 791, 817-9.

Feb: Galvanizing bath temperature in relation to weight of zinc coat. Mar: Effect of gage of base metal; time and weight of coating Apr: How gage factor and submersion time act separately. May: Pickling time. June: Withdrawal time. July: Review.

30. "Third International Conference on Hot Dip Galvanizing" Zinc Development Assn, Oxford, England, 1954, 268 p., $2.2.0

17 papers by authors from United States and various European countries cover dress formation, after treatment, bath heating, inspection, productivity, cost estimating, and more specialized processes used in galvanizing sheet and strip, tubes, wire, and threaded parts; subject index. Eng Soc Lib, NY.

31. "Some Notes on Effect of Presence of Iron Salts in Hot-Dip Galvanizing" H. Bablik, F. Goetzl, E. Nell, Metal Finishing J v 1 n 8 Aug 1955, p 347-8.

Effect produced by iron salts on surface of goods to be galvanized in aluminum-containing baths; importance of removing all iron salts from surface of iron and from flux in order to avoid formation of alloy layer.

32. "Research on Painting of Galvanized Sheets" G. Odone, G. Milanese, E. Dellepiane, Acier Stahl Steel v 25, n 12 Dec. 1960, p 477-82.

Study made in cooperation with Italian point manufacturers whose paints of various formulation were used in tests; examination of surface to be painted was followed by laboratory investigation of principal mechanical characteristics and corrosion resistance of paint films results of 24 mo exposure in marine atmosphere. 22 refs.

33. "Corrosion Resistance of Some Sprayed Metallic Coatings, T. K. Ross, E. L. Smith, Brit Chem Eng v 6 n 3 Mar 1961, p 172-5.

Experimental study of level of cathodic protection by aluminum, zinc and magnesium applied to mild steel as sprayed coatings; aluminum can give strong cathodic protection during initial period of any new corrosive conditions; zinc would rely more upon steady built-up of chemically stabilized surface layer; magnesium is too reactive.

34. "Zinc Filled Inorganic Coatings" Corrosion v 17 n 8 Aug 1961, p 107-9.

Report of Nat Assn Corrosion Engrs Tech Unit Committee T-68 on used, corrosion resistance, and application of zinc filled inorganic coatings.

35. "Dyed Zinc Coatings" H. W. Dettner, Electroplating & Metal Finishing v 14 n 7 July 1961, p 233-4.

In new method which parts are rinsed after at least 0.2 mil zinc is plated in normal way after which cyanide residues are neutrolized with very dilute (about 0.3%) nitric acid or 2% hydrochloric acid or sulphuric acid, followed by brightening in special chromate bath; new process makes it possible to produce gold color on zinc

and has also been applied to galvanized to galvanized steel strip; examples of chromated and dyed zinc coatings on steel shown.

36. "How to Tell Good Hot Dip Galvanizing" Steel v 146, n 26, June 27, 1960, p 7609.

Photomicrographs can reveal much about quality; visual inspection will also show many coating defects and indicate whether good practice has been followed; typical defects are described and supplemented by photographs indicating examples of overpickled steel, white rust, water staining, flux spots, oxide, scruff, dross, lumps and projections, uncoated areas, and acid spots.

37. "Strip Galvanizing Gains Popularity" Steel v 147, n 13, Sept. 26, 1960, p 124-5.

Armco-Sendzimir galvanizing process, pioneered by Armco Steel Corp. is undergoing wider use because of increased fibracator acceptance of galvanized steel strip; demand for metallic coated sheet is expected to grow faster than market for unfinished material owing to cost savings and longer service life; material offers economic advantage for use in corrosive or humid applications; sequence of operations, and equipment used in galvanizing and aluminizing processes.

38. "Sprayed Metal Coatings" G. A. Curson, Brit Welding J v 7 n 5 May 1960, p 312-7.

Powder process; wire spraying; surface preparation; sprayed zinc and aluminum coatings used for protection of iron and steel; automatic grit blasting and metal spraying plant; work done on site.

39. "Thick Vaccum Metallized Coatings are Durable, Corrosion Resistance" P. J. Clough, H. M. Farrow, Matls in Design Eng v 52, n 3 Sept. 1960, p 12-15.

Coatings now obtainable in thickness comparable to electroplated of other metals, are pure, uniform adherent and colorable; seven important advantages of new process, with most of development work to date confined to high purity aluminum and cadmium coatings; how coatings are applied.

40. "Corrosion Fatigue; its Prevention by Zinc Coatings" G. Fitzgeraldlee, Corrosion Technology v 6 n 11 Nov. 1959, p 330-2, 340-1.

Principles of corrosion fatigue; cathodic protection offered by zinc; comparison of results obtained by electroplating, hot-dip galvanizing, spraying, and painting with heavily zinc pigmented paints.

41. "Heat-Plating" - New Process for Deposition of Tungsten Carbide and Nickel, and for Hardfacing" Metal Finishing J v 6 n 62, Feb. 1960, p 49-50, 54.

Similar to article indexed in Engineering Index 1959, p 1078 from Carbide Eng Jan. 1959.

42. "Industrial Application of Zinc-Filled Inorganic Coatings" F. P. Helms, Corrosion v 16 n 6 June 1960, p 24, 26, 28 (discussion 28, 30)

Principal characteristics of zinc-filled and modern organic coatings are compared, as well as zinc-filled inorganic coatings are compared and also organics in their resistance to corrosives, surface preparation, and under-surface corrosion; various uses for zinc silicates are reviewed with comments on service experience; problem involving overcoating is considered and some means of solving it presented; materials are considered especially suitable for environments in southern areas near salt water.

43. "New Surfacing Methods Vie With Old for High Temperature Process Applications" J. R. Schley, Chem Eng v 67 n 6 Mar 21, 1960, p 184, 186, 188, 190.

Useful metallic coatings to permit maximum use of small quantities of expensive, high performance materials; metals and their refractory oxides are most useful materials for temperature range beyond 500 F; data on flame plating, plasma-arc spray, diffusion coating, hot-dip coating, etc.

44. "Hot-Dip Galvanizing of Cast Iron" M. H. Davies, Foundry Trade J v 105, n 2199, Dec. 4, 1958, p 685-7.

Castings usually galvanized by wet process and quenched in water after galvanizing; importance of good casting surface finish and superlative cleaning in initial stages stressed; special problems encountered; effect of composition and design.

45. "Hot-Dip Galvanizing of Sheet and Strip" J. Hawkins, E. J. Williams Australian Inst Metals-J v 4 n 1 May 1959, p 49-60.

Steel rolling techniques and their effect of physical characteristics of product; development of hot dip galvanizing process, equipment used and final product considered.

46. "Large Gas-Radiant-Fired Kettle Improved Galvanizing of Steel Structural Products" R. E. Buckholdt, Indus Heating v 26, n 9 Sept. 1959, p 1722, 1724, 1726, 1728, 1831.

Buffalo Steel Corp. Tonawanda, NY, produces galvanized products by use of gas fired radiant heating incorporated in design of furnace which is part of galvanizing department; production of re-rolled products such as high strength angles, merchant bars, complete fencepost, etc. rolled from railroad rails that have been replaced; galvanizing practice; method of heating galvanizing bath with Duradiant burners and principle of galvanizing kettle firing.

47. "Chemical Treatment against Corrosion of Galvanized Steel Produced in Continuous Lines" G. Odone, G. Milanese, Metal Finishing J v 5 n 51, Mar 1959, p 237-40.

Investigation reported in which experiments were conducted with passivating bath of great efficiency, easy preparation and application, and with good protective properties for prevention of white rusting on galvanized sheets and coils; optimum results are confirmed by more than year of practical application on continuous galvanizing line.

48. "Hot-Dip Galvanizing of Cast Iron" M. H. Davies, Foundry Trade J v 105 n 2199 Dec. 4, 1958, p 685-7.

Castings usually galvanized by wet process and quenched in water after galvanizing; importance of good casting surface finish and superlative cleaning in initial stages stressed; special problems encountered; effect of composition and design.

49. "Hot-Dip Galvanizing of Cast Iron" M. H. Davies, Foundry Trade J v 105 n 2199, Dec. 4, 1958, p 685-7.

Castings usually galvanized by wet process and quenched in water after galvanizing; importance of good casting surface finish and superlative cleaning in initial stages stressed; special problems encountered; effect of composition and design.

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51. "Large Gas-Radiant-Fired Kettle Improves Galvanizing of Steel Structural Products" R. E. Buckholdt, Indus Heating v 26 n 9 Sept. 1959, p 1722,1724,1726,1728,1831.

Buffalo Steel Corp. Tonawanda, NY, produces galvanized products by use of gas fired radiant heating incorporated in design of furnace which is part of galvanizing department; production of re-rolled products such as high strength angles, merchant bars, complete fencepost, etc. rolled from railroad rails that have been replaced; galvanizing practice; method of heating galvanizing bath with Duradiant burners and principle of galvanizing kettle firing.

52. "Metallized Coatings" S. J. Oechsle, Plant Eng v 13 n 3 Mar 1959, p 104-7.

Machine element metallizing for resurfacing of worn areas; corrosion contamination metallizing for cathodic protection; high temperature metallizing for corrosion protection; combination coatings for sealing and protection of sprayed metal surfaces; materials used are Zn, Al, plastics, Ni-Cr, and ceramic mixtures.

53. "Copper Sulphate Test and Visual Examination of Hot-Dip Galvanized and Sheradized Coatings" Brit Standards Instn-Brit Standard n 729 1959, 7 p.

Standard applies to specified articles, coating of which is substantially of zinc; articles are bolts, nuts, and other threaded articles of similar size; articles fabricated from strips, bars or tubes up to length of 3 ft. and not exceeding 3 in. width or 2 in diam; castings, angle brackets and structural shapes with overall size of not more than 8 x 6 x 4 in. and approximate weight of not more than 8 lb., coated after fabrication.

54. "Fabricating Continuous Galvanized Steel" E. W. Horvick, Steel Processing & Conversion v 44, n 1, 2, Jan 1958, p 43-6.

Application of hot dip and continuous hot dip galvanizing, and zinc coating by electrodeposition; how to specify fabrication possibilities of continuously galvanized steel; welding by various methods.

55. "Some Considerations in Relation to Hot-Dip Galvanizing of Guard Rails" H. Bablik, F. Goetzl, E. Nell, Metal Finishing J v 4 n 44 Aug 1958, p 297-300.

Curves presented showing increase in thickness of metal coating and of iron-zinc alloy layer with dipping time at varying concentration of aluminum in bath, and with aluminum concentration at various dipping times; making proper addition of aluminum to galvanizing bath is considered as only way to produce zinc coating of adequate thickness to meet service requirements of guard rails.

56. " Chromates as Applied to Hot Dip Zinc Coated Wire" M. S. Siddall, Wire & Wire Products v 33 n 7 July 1958, p 768-9, 809.

Application of one-dip "bright chromate"; amount of aluminum used as brightening agent in zinc pot; type of wipes and lubricant used, and temperature at which wire enters chromate; factors influencing function of chromate such as travel speed of wire, immersion time, chromate temperature, concentration, pH, and tri-hex ratio.

57. "Galvanizing: New Ways for Old Process" A. T. Balwin, W. H. McMullen, Iron Age v 180, n 12, Sept 19, 1957, p 150-3.

Sources of iron contamination; self cleaning bath; use of aluminum as additive to bath; kettle design; progress made in mechanization of hot galvanizing; processing of various products such as wire, wire fabrics, pipe, etc, bolts, nuts and washers and heavy structural pieces; continuous galvanizing.

58. "Get More Protection From Galvanized Coatings" A. T. Baldwin, W. H. McMullen, Iron Age v 179, n 13, Mar 28, 1957 p 115-7; see also Products Finishing v 21 n 9 June 1957, p 86, 88, 90-2; Wire & Wire Products v 32, n 6 June 1957, p 662-3.

Development of galvanizing techniques; new metallographis studied suggesting ways of making thicker zinc coatings better; use of 0.10 to 0.20% aluminum in zinc baths for galvanizing strip steel, and other radical changes in process; new information on structural condition of hot galvanized coatings, accomplished by photomicrographs; transverse, logitudinal and tapered sections of same galvanized wire compared; how iron and aluminum affect galvanized coatings.

59. "Hot Dip Galvanizing-General Review, Corrosion Prevention & Control v 4 n 8 Aug 1957, p 44-6.

Comparison with other zinc coatings; importance of steel surface preparation; properties of galvanized coatings and their control; examples of applications.

60. "Two-Step Process Retards White Rust" L. J. Brown, Iron Age v 178, n 19 Nov 8, 1956, p 106-9.

Bad effects of white rust often called "humid storage stain", which occurs on galvanized steel in storage or in transit; new treatment developed by Pennsalt Chemicals involves first creation of water repilent film on cleaned galvanized surface; immersion in chromic type bath then develops corrosion inhibiting properties in film; test methods for determining corrosion resistance of galvanized steel.

61. "Continuous Hot Dipped Galvanizing" N. E. Cook, M. D. Ayers, Iron & Steel Engr v 33 n 4 April 1956, p 53-7.

Latest development in field of galvanizing by Wheeling Steel Corp. in this process it is possible to regulate degree of tightness of zinc coating by controlling amount of aluminum; this aluminum unites with any iron which would normally tend to form alloy layers with zinc on surface of steel being coated.

62. "Here's Some Design Tips to Consider When Parts Call for Hot Dip Galvanizing" H. Slack, Western Metals v 14 n 3 Mar 1956, p 56-7.

Design and preparation of material to be galvanized; methods for reducing warpage to minimum; material should be designed for single dip operation whenever possible; three accepted galvanizing inspection standards.

63. "Paint-Zinc Combinations for Corrosion Protection of Iron & Steel" E. E. Halls, Electroplating & Metals Finishing v 9 n 6 June 1956, p 186-7.

Reference made to previous article (Engineering Index 1954, p 638) on results of accelerated corrosion tests on coating systems on mild steel involving paint over sprayed zinc or hot dip galvanized under coatings; outdoor exposure tests on some protective systems.

64. "Temporary Corrosion Preventives" Corrosion Prevention & Control v 3 n 10 Oct 1956, p 31-2, 46.

Materials used for providing protection primarily for transportation and storage period of metal articles; hard and soft fill, solvent deposited; soft film, hot dipping, grease, and slushing; oil film; strippable hot dip coating; vapor phase inhibitor; "Concooning."