

Introduction

and Editor's comments about the 2022 Edition of
The Extrusion Press Maintenance Manual



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This Manual was originally published in 1996 and offered as a print only version. The 2nd Edition in 2000 was a general revision and update with improved duplex typography and graphics, and the CD-ROM version of the 2nd Edition was offered in 2001. The 3rd Edition was published in 2004, with addition of versions on USB flash drive or by email. Now revisions are made as new information becomes available, and the latest versions are printed or copied on-demand.

This Manual began as a project of the Aluminum Extruders Council Tech Services Committee. The idea was to provide a reference and training tool for newcomers to the extrusion industry --- especially anyone working with older presses where the original manuals have been lost and the original maintenance people aren't around any more.

Since the 1st Edition in 1996, the available information about extrusion equipment has grown substantially, so much so that we decided to redefine the Manual as “**the essential reference for extrusion plant managers.**” The goal is to bring together in one place all of the useful information we can find about extrusion equipment, to make it the first place that maintenance personnel, plant engineers, managers, trainees --- everyone in the industry --- can turn to for answers and instruction. We've touched on repairs, preventive maintenance, installation, modernization --- anything useful we could find about the subject.

If you look carefully you will find different recommendations by different contributors, for example, the frequency and procedures for press inspections. I have not tried to remove or resolve these contradictions, but left them in so that the reader will have the benefit of all available advice. Sometimes even the experts don't agree, and you must choose between conflicting recommendations.

Please note that I claim to be the **Editor** (as opposed to **Author**) of this Manual, since most of the material has been gathered from other sources. I have compiled it, in many cases rewritten it for clarity and conciseness, formatted it, and commented on it. I've tried to give proper credit for all material used (please let me know if I failed to properly credit anyone), and tried to leave references so the reader can get additional information if necessary.

So, I want to thank everyone who has shared their know-how for this Manual, especially to those who have prepared technical papers and made presentations at seminars. You have helped to make our industry strong and competitive by passing along your experience and knowledge to those who will follow in your footsteps.

A handwritten signature in blue ink that reads "Al Kennedy". The signature is written in a cursive, flowing style.

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References

- 1984 Saw Noise Report and 1987 Saw Noise Report. Aluminum Extruders Council, Chicago IL, USA.
- Aluminum Extruders Council, "Extrusion Dies and Tooling Manual: Recommended Handling and Maintenance," www.aec.org.
- Allen-Bradley Division of Rockwell Automation, "Maintenance of Industrial Control Equipment," from Publication C-111, March 1995. 1201 South Second Street, Milwaukee WI 53204.
- American Society of Mechanical Engineers, "Graphic Symbols for Fluid Power Diagrams - USAS Standard Y32.10," Fairfield NJ 07007.
- Anthofer, E.J., "Press Alignment," *Proceedings of 2nd International Aluminum Extrusion Technology Seminar*, Vol. I, (1977), p. 169-173.
- Baldwin, M. Dana, "Extrusion Sawing: Tighter Tolerance at Quadruple Production," *Modern Metals Magazine*, January, 1996.
- Bartelt, Alan, "Extrusion Hazards and Risk Reduction," *Proceedings of 8th International Aluminum Extrusion Technology Seminar*, (2004).
- Beer, Stefan, "Improved Operation of Single Billet Induction Heaters by Modern Plant Design and Modern Plant Technology," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar*, (2004).
- Bergman, John, "Press Alignment Using 3D Laser Technology," presented at AEC Press Maintenance Seminar, (2002), Chicago.
- Bessey, Guy, "Fixed Dummy Block Design," *Proceedings of 4th International Aluminum Extrusion Technology Seminar*, Vol. II, (1988), p. 131-133.
- Bugai, John, "Billet/Log Furnace and Shear Maintenance," papers presented at AEC Press Maintenance Seminars, (1991 and 1995), Chicago.
- Castle, Alan F., "Fixed Dummy Block Extrusion," *Proceedings of 4th International Aluminum Extrusion Technology Seminar*, Vol. II, (1988), p. 134-134.
- Castle, Alan F., "Improving Fixed Dummy Block Performance," *Proceedings of 6th International Aluminum Extrusion Technology Seminar*, Vol. I, (1996), p. 301-304.
- Chien, Ken; Dixon, Bill; Robbins, Paul; and Jowett, Chris; "The Design and Benefits of a Thermally Stable Container," *Proceedings of 11th International Aluminum Extrusion Technology Seminar*, (2016), p.427-450.
- Colden, Rick, and Cramlet, Adam, "Catastrophic Failure: A 48 Hour Remedy," *Proceedings of 8th International Aluminum Extrusion Technology Seminar*, (2004).
- Conserva, M., Donzelli, G., and Trippodo, R., *Aluminium and its Applications*, Edimet SpA, via Corfu 102, 25124 Brescia, Italy.
- Crosti, M., "Thermal Alignment: Temperature Control in Extrusion Technology," presented at Aluminium 2000, Rome, March 2003.
- Cunningham, James, "Review of Proper Bolting Practices – Applying Torque or Tension to a Bolted Connection," *Proceedings of 11th International Aluminum Extrusion Technology Seminar*, (2016), p.521-535.
- Davidson, Wilson, and Kazanowski, Pawel, "Analysis and Modification of a Prematurely Fractured Container Shifting Rod," *Proceedings of 11th International Aluminum Extrusion Technology Seminar*, (2016), p.537-554.
- Demar, Ben, *Basic Mechanical Aspects of an Extrusion Press Rebuild*, presentation at AEC Press Maintenance Workshop, Atlanta, April 2018.
- Demar, Ben, *Understanding Your Press Components from a Maintenance Perspective*, presentation at AEC Press Maintenance Workshop, Atlanta, October, 2021.
- Dickson, Richard, and Jowett, Chris, *Press Alignment and its Impact on Extrusion Performance*, presentation at AEC Press Maintenance Workshop, Atlanta, April 2014.
- Douglas, M., "High Temperature Textile Products for Aluminum Extrusion Handling Systems," *Proceedings of 6th International Aluminum Extrusion Technology Seminar*, Vol. II, (1996), p. 287-292.
- Dunn, Dan, *Press Tooling and Die Heating*, presentation at AEC Press Maintenance Workshop, Atlanta, April 2018.

- Dunn, Dan, *Press Tooling & Temperature Control*, presentation at AEC Press Maintenance Workshop, Atlanta, October 2021.
- Dyla, James, "Protect Your Press Tools," *Proceedings of 7th International Aluminum Extrusion Technology Seminar*, Vol II, (2000), p. 277-282.
- Dyla, James, "Enhanced Tool Lubrication Systems," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar* (2004).
- Dyla, James, *Aluminum Extrusion Process Lubrication Systems*, presentation at AEC Press Maintenance Workshop, Atlanta, April 2018.
- Eidson, B., "Improving Equipment Effectiveness Through Total Productive Manufacturing," *Proceedings of 6th International Aluminum Extrusion Technology Seminar*, Vol. II, (1996), p. 315-319.
- Ferryman, Roger L., "Proper Handling of Hydraulic Oil in the Extrusion Press," *Proceedings of 5th International Aluminum Extrusion Technology Seminar*, Vol. II, (1992), p. 583-585.
- Fielding, Roger A. P. and A. J. Bryant, "The Quest for Optimal Extrusion Billet Heating," *Light Metal Age*, Vol. 59, No. 8, August 2001, 24 - 36.
- Fourmann, Jerome, *Metallurgy and Artificial Ageing Principles*, presentation at AEC Press Maintenance Workshop, Atlanta, April 2018.
- "Fractography," *ASM Metals Handbook*, 9th Ed., Vol. 12, *ASM International*, 1992.
- Freese, Howard W., "Alignment of the Extrusion Press," *Proceedings of 3rd International Aluminum Extrusion Technology Seminar*, Vol. I, (1984), p. 105-111.
- Freri, Enrico, "Advantages of a 'Special Nozzles' Cooling Tunnel," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar* (2004).
- Gaube, Doris, "Technical Textiles for Handling Systems: Introducing High Tech While Avoiding Basic Mistakes," *Proceedings of 6th International Aluminum Extrusion Technology Seminar*, (2004).
- Gramaticopolo, F., "Flying Cut Puller Without Hand-off," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar* (2004).
- Gramaticopolo, F., and Kennedy, Al, "Modifications to the Extrusion Press and Handling System for Increased Reliability and Productivity," *Proceedings of 5th International Aluminum Extrusion Technology Seminar*, Vol. II, (1992), p. 263-271.
- Grube, Jeff, *Extrusion Press Hydraulics*, presentation at AEC Press Maintenance Workshop, Atlanta, April 2015.
- Hahnel, Werner, "Mastering Challenges in Aluminum Extrusion Through the Use of Premium Steels," *Aluminium International Today*, September/October 2021, page 37.
- Hahnel, Werner, and Herder, Manfred, "Tool Steel and Design of Modern Containers for Extrusion of Light Metal," *Proceedings of 8th International Aluminum Extrusion Technology Seminar*, (2004).
- Hayes, Jack, "Proper System Maintenance to Avoid Contamination and Cavitation," presented at AEC Press Maintenance Seminar, (1991), Chicago.
- Hull, D., "Fractography. Observing, Measuring and Interpreting Fracture Surface Topography," *Cambridge University Press*, 1999.
- Industrial Ventilation Manual, published by the Committee on Industrial Ventilation, PO Box 16153, Lansing MI 48901 USA. Sales: American Conference of Governmental Industrial Hygienists, 1300 Kemper Meadow Drive, Cincinnati OH 45240 USA. www.acgih.org/resources/press/vent25th.htm.
- Jenista, David, "Practical Non-Contact Temperature Measurement for Gas-Fired Billet Heating Furnaces," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar*, (2004).
- Johnen, Willi, "Further Developments with Regard to Single-Billet Induction Heaters for Light Metal Extrusion Billets," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar* (2004).
- Jowett, Chris, "The Importance of Tooling Temperature Control," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar* (2004).
- Jowett, Chris; Johannes, Veikko; Langille, Al; Fraser, Warren; and Yoshimura, Hideki, "The Causes of Variation in Extruded Section Weight," *Proceedings of 7th International Aluminum Extrusion Technology Seminar*, Vol. I, (2000), p. 1-16.

- Kennedy, Al, "Modernizing the Extrusion Press and Handling System: Adapting New Technology to Older Plants," *Proceedings of 6th International Aluminum Extrusion Technology Seminar*, Vol. I, (1996), p. 105-112.
- Kennedy, Al, "Modernizing the Extrusion Press and Handling System," presented at AEC Press Maintenance Seminar, (1991), Chicago.
- Kennedy, Al, "Modernizing the Older Press and Related Equipment," presented at AEC Press Maintenance Seminar, (1995), Chicago.
- Kennedy, Al, "Ten High-Tech Tools for Extrusion Plant Maintenance," presented at the Aluminium 2000 Conference in Rome, March, 2003.
- Kennedy, Al, "The Extrusion Press Line for 2024: A Forecast," *Proceedings of 8th International Aluminum Extrusion Technology Seminar*, (2004)
- Laue, Kurt, and Stenger, Helmut, *Extrusion*, American Society for Metals, Metals Park, Ohio 44073.
- Luscombe, Jon, "Log Furnace Maintenance," presented at AEC Press Maintenance Seminar, (1995), Chicago.
- Luscombe, Jon, "Billet Heaters and Log Shears: Servicing for Optimum Performance," presentation at AEC Maintenance Seminar, (2002), Chicago.
- MacGregor, Charles W., "Mechanical Properties of Materials," *Marks' Mechanical Engineers' Handbook*, Sixth Edition, McGraw-Hill Book Company, Inc., New York, NY, p. 5-2.
- Mahmoodkhani, Yahya, and Paul Robbins; "Material Selection for Extrusion Tooling, Part I," *Light Metal Age Magazine*, October 2021, page 30.
- Mahmoodkhani, Yahya, and Paul Robbins; "Material Selection for Extrusion Tooling, Part II," *Light Metal Age Magazine*, December 2021, page 16.
- Manganello, Ron, "Non-Destructive Examination of Extrusion Press Hydraulic Cylinders," *Proceedings of Extrusion Technology Seminar ET12*, Miami, May 2012.
- Marinelli, M., "Building a Better Age Oven," *Proceedings of 7th International Aluminum Extrusion Technology Seminar*, Vol. I, (2000), p. 469-472.
- Mason, Bill, and Molitor, Mel, Session on Die Correction at 1989 Die Workshop, Aluminum Extruders Council, (October 1989), Chicago.
- Maxon Corporation, "Maxon '400' OVENPAK® Gas Burners – Installation and Start-Up Instructions," www.maxoncorp.com.
- Mulder, Joseph E. V., and Smith, Gavin J., "Extrusion Press Alignment with Modern Technology," *Proceedings of 7th International Aluminum Extrusion Technology Seminar*, Vol. I, (2000), p. 455-463.
- New York Blower Company, The, "Installation, Maintenance, Operating Instructions," 7660 Quincy Street, Willowbrook IL 60521-5596, USA.
- Nøkleby, J.O., "Adapting Extrusion Presses for a High Cycle Fatigue Load Environment," presentation at AEC Maintenance Seminar, (1995), Chicago.
- North American Combustion Handbook*, 2nd Edition, North American Mfg. Co., Cleveland OH 44105 USA, p. 296.
- Oilgear Company, The, "Service Suggestions," Bulletin 910000A, March, 1994. 2300 So. 51st. Street, Milwaukee WI 53219.
- Oilgear Company, The, "Hydraulic System Survival Techniques," Bulletin 90012, December, 1994. 2300 So. 51st. Street, Milwaukee WI 53219.
- Oilgear Company, The, "Filtration Recommendations," Bulletin 90007-D, May, 1994. 2300 So. 51st. Street, Milwaukee WI 53219.
- Oilgear Company, The, "Piping Information," Bulletin 90011-F, May, 1994. 2300 So. 51st. Street, Milwaukee WI 53219.
- Oilgear Company, The, "Instructions – Storage Recommendations for Oilgear Units," 90006B, May, 1994. 2300 So. 51st. Street, Milwaukee WI 53219.
- Pope, James M., "Extrusion Container Care and Maintenance," presented at AEC Press Maintenance Seminar, (2002), Chicago.
- Proceedings of the Workshop on the Control of Metal Sawing Noise in the Aluminum Industry*, June, (1976). The Aluminum Association, Washington DC.
- Parker Filter Division, "Parker Hydraulic Products and Total Systems Engineering," Metamora OH. Catalog 0108, p. 179.
- Ramanan, Ram, "How to Obtain the Most from Your Ageing Ovens," *Proceedings of 6th International Aluminum Extrusion Technology Seminar*, Vol. I, (1996), p. 269-273.

- Robbins, Paul, "Dummy Blocks, Clean Out Blocks, Lubrication and Film Coatings, and Alignment (the Enemy)," presented at AEC Press Maintenance Seminar, (1995), Chicago.
- Robbins, Paul, "Superextruders: Improving Container Life Through Temperature Control," *Light Metal Age Magazine*, April 2003, Page 44.
- Robbins, Paul; Dixon, Bill; Chien, Ken; and Jowett, Chris; "Today's Understanding of the Function and Benefits of DummyBlock Design," *Proceedings of 11th International Aluminum Extrusion Technology Seminar*, (2016), p.387-404.
- Rutkowski, Richard, "Upgrading Extrusion Presses with Variable Frequency Drives," *Proceedings of 8th International Aluminum Extrusion Technology Seminar*, (2004).
- Sant, Russell J., "Preventive Maintenance: If It Ain't Broken, Don't Fix It!" presented at AEC Press Maintenance Seminar, (1991), Chicago.
- Schreiber, Marco; Sacristani, Giovanni; Guilotta, Giorgio; and Fraternali, Paolo; "Energy Saving in Extrusion Presses – Latest Developments," *Proceedings of 11th International Aluminum Extrusion Technology Seminar*, (2016), p.471-487.
- Spizzo, M., "Innovative F.T.S. Three Puller Automatic Stretcher System," *Proceedings of the Eighth International Aluminum Extrusion Technology Seminar* (2004).
- Stewart, John S., "Aluminum Extrusion Sawing Noise Reduction," *Proceedings of 4th International Aluminum Extrusion Technology Seminar*, Vol. II, (1988), p. 423-427.
- Stott, J.G. and B. Wilkins, "A Low Energy, Reliable, Electro-Hydraulic System for Extrusion Presses," *Proceedings of the Seventh International Aluminum Extrusion Technology Seminar*, Vol. I, (2000), o. 465-468.
- Sudhakara, C. J., Information on a catastrophic extrusion press hydraulics fire, with recommendations for preventing recurrence.
- Turla, Davide, and Guerrini, Alessandro, "Eco+Logic 2.0 – Saving Energy at the Extrusion Press," *Proceedings of 11th International Aluminum Extrusion Technology Seminar*, (2016), p.489-498.
- Van Dine, Dennis, "Thermal Control of the Extrusion Press Container," *Proceedings of 8th International Aluminum Extrusion Technology Seminar*, (2004)
- Wieser, Volker; Sommitsch, Christof; Haberfellner, Kurt; and Lehofer, Paul;" New Developments in the Design and Production of Container Assemblies, " *Proceedings of 8th International Aluminum Extrusion Technology Seminar*, (2004).
- Wirtz, Rodney, "A Lock Out/Tag Out Procedure that Works," *Proceedings of 4th International Aluminum Extrusion Technology Seminar*, Vol. II, (1988), p. 421-422.
- Wu, Benson, "The Competitiveness of the Chinese Extrusion Industry," presented at Aluminium 2000, Rome, March 2003, sponsored by Interall SRL, Modena, Italy.

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