

MOTOR MANUFACTURING 101 - SHORT COURSE

While the basic process for assembling small motor stators has changed little over the past 30 years, increased international competition has driven manufacturers to seek significant process improvements in their facilities. Although many subtle improvements in assembly processes are ongoing (i.e. Lean Manufacturing), equipment modernization also needs to be implemented in order to achieve maximum product quality and minimize labor costs. In addition, drastic changes in motor control technology, coupled with the reduction in the cost of microprocessors, has given birth to an entire range of variable speed motors which were not available 10 to 15 years ago.

This paper will discuss the steps involved with assembling a stator for a small electric motor. It will also cover some of the recent advancements in technology implemented in many facilities that improved stator quality while minimizing labor, production and material costs.

STATOR CORE ASSEMBLY

Lamination Selection

Lamination stacking is either performed by hand selecting (by weight or height) or by automatic stack selection. Although automatic stack selection minimizes operator intervention with the core build process, most machines still require frequent operator attention. If the lamination process is inconsistent, automatic selection holds little benefit over hand selecting.

Manual stack selection still remains the most popular method, since an operator can easily compensate when selecting laminations with problems like adhering laminations from heavy burrs, oil or annealing oxidation. To assure stack height accuracy with manually selected laminations, motor manufacturers are using electronic gauges mounted to the core securing machine.

Welding

Welding is a popular and widespread method for securing stator cores. New welding machines offer flexibility and reliability since many have eliminated the need for hydraulic operation.

Despite recent advancements in machine design, welding has a number of drawbacks since a welding machine requires manual loading of the laminations and a high level of maintenance. This maintenance activity (including torch tip adjustments, the monitoring of argon and the sharpening of torch rods) usually requires the attention of a skilled operator or technician. This is an additional concern to the electric motor design since stator core loss could occur by welding across the laminations.

Cleating



This process "V" rolls and then flattens a strip of soft steel down a dovetail slot on the O.D. of the stator laminations. The cleating strip steel is low cost and the process is fast. Cleating machines are extremely flexible and require little setup. Unlike welding, cleating still leaves the stator with

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Catalog Oklahoma State University,1937 *Industrial Education* ,1990 **Industrial education** United States. Bureau of Labor,1911 New York Produce Review and American Creamery ,1913 **Machinery** ,1908 *Technical Abstract Bulletin* ,1964 Employment Management and Safety Engineering American School (Lansing, Ill.),American School of Correspondence, Chicago,1919 *Annual Report of the Commissioner of Labor* United States. Dept. of Labor,1911

Treatise on Process Metallurgy Alexander McLean,Roderick Guthrie,Sridhar Seetharaman,H. Y. Sohn,2024-08-23
Treatise on Process Metallurgy Volume Four Industrial Production provides academics with the fundamentals of the manufacturing of metallic materials from raw materials into finished parts or products In these fully updated volumes coverage is expanded into four volumes including Process Fundamentals encompassing process fundamentals structure and properties of matter thermodynamic aspects of process metallurgy and rate phenomena in process metallurgy Processing Phenomena encompassing interfacial phenomena in high temperature metallurgy metallurgical process phenomena and metallurgical process technology Metallurgical Processes encompassing mineral processing aqueous processing electrochemical material and energy processes and iron and steel technology non ferrous process principles and production technologies and more The work distills the combined academic experience from the principal editor and the multidisciplinary four member editorial board Provides the entire breadth of process metallurgy in a single work Includes in depth knowledge in all key areas of process metallurgy Approaches the topic from an interdisciplinary perspective providing broad range coverage on topics **Annual Report of the Commissioner of Labor** United States. Bureau of Labor,1911

A Brief History of Economic Thought Bougrine, Hassan,Rochon, Louis-Philippe,2022-07-22 It is now widely acknowledged that history is useful even essential because it helps us predict the future The history of ideas in economics as in other fields of inquiry plays an important role in enlightening current researchers as they endeavour to understand contemporary events and anticipate the future of human societies This book brings together a fine collection of chapters that span contributions from forgotten classics to the most recent new thinking about critical issues such as growth wealth its creation and its distribution among members of society It is A Brief History of Economic Thought but it will certainly go a long way in helping undergraduate students and other researchers who are curious about the evolution of economic ideas over the last five centuries **Workforce Education** William B. Bonvillian,Sanjay E. Sarma,2021-02-02 A roadmap for how we can rebuild America s working class by transforming workforce education and training The American dream promised that if you worked hard you could move up with well paying working class jobs providing a gateway to an ever growing middle class Today however we have increasing inequality not economic convergence Technological advances are putting quality jobs out of reach for workers who lack the proper skills and training In Workforce Education William Bonvillian and Sanjay Sarma offer a roadmap for rebuilding America s working class They argue that we need to train more workers more

quickly and they describe innovative methods of workforce education that are being developed across the country **Pulp and Paper Magazine of Canada** ,1905 *Hearings, Reports and Prints of the Joint Economic Committee* United States. Congress. Joint Economic Committee,1975 Telegraphic Journal and Monthly Illustrated Review of Electrical Science ,1888 **The Telegraphic Journal and Electrical Review** ,1888 **The Manufacturer and Builder** Peter Henri Vander Weyde,William Henry Wahl,1870 Billed in early issues as a practical journal of industrial progress this monthly covers a broad range of topics in engineering manufacturing mechanics architecture building etc Later issues say it is devoted to the advancement and diffusion of practical knowledge **Annual Report of the Commissioner of Labor** ,1911
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emission. It ... 60 s - 1 min

SECTION 25.2 NUCLEAR TRANSFORMATIONS. 1. Write a nuclear equation for the following radioactive processes. a. alpha decay of francium-208 $^{208}\text{Fr} \rightarrow \text{b} \dots$

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4 eye 5 close. 6 wary. Exercise 2 page 52. 1 ... 4 English-speaking 5 densely populated. 6 mind-blowing 7 bleary-eyed.
Exercise ...