CERTIFIED MANUFACTURING TECHNOLOGY SALES ENGINEER (CMTSE)

BODY OF KNOWLEDGE

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Body of Knowledge last update: November 15, 2024

TOPICS	
1.0	**General Information about the CMTSE Program, history and evolution of content over time since the inception of the certification program in 1993.**
1.1.	General Information Explain the CMTSE certification process and the SME certification committee.
1.2.	Certification Procedures Explain the three steps to earn the CMTSE certification.
1.3.	Exam and Study Guide development Describe how we created the CMTSE Study Guide and exam. Both were developed following an industry-accepted process and discipline identical to those used by professional certification organizations across the US.
1.4.	Study Guide Objectives Review study guide objectives and the three components of exam preparation.
1.5.	Recommended Study Plan Explain the 5-step study plan.
2.0	**Territory and Customer Development: Understanding of the geographic and customer-specific make up of territory assignments and developing qualified prospects and customers within the given territory.**
2.1.	Introduction Describe key marketing and planning aspects of the account sales engineers functional role.
2.2.	Marketing Plans Define what is a marketing plan and explain how that creates a roadmap for success.
2.3.	Territory Appraisal Define how to work a sales territory efficiently and explain how to develop a strategy that will achieve sales goals.
2.4.	Locating New customers Explain how to locate new customers and how to build trusting partnerships and gain referrals.
2.5.	Classifying Customers Explain the importance of classifying customers and how this is accomplished.
2.6.	Ranking Customer Potential Describe the process of ranking customers according to their sales potential.

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2.7	Evaluating Customers Explain how important it is to know your customer and how this creates a competitive advantage.
2.8	Prospecting Describe how to cultivate sales leads and what the prospecting process includes. Define the five basic types of sales leads.
2.9	Competitive Analysis Explain how to gain an understanding of each competitive source.
2.10	Sales Forecasting Explain how sales forecasts are utilized Describe how short term and long term sales forecasts assist in building manufacturing sales
3.0	**Planning and Organizing: Learning and developing time and territory management skills specifically for sales professionals.**
3.1	Introduction Explain how job-related time management, organization and planning, and goal setting can improve sales productivity.
3.2	Time and task management Explain the difference between priority driven versus time/task driven time management skills.
3.3	Goal setting techniques Explain the importance of setting business goals to achieve sales targets.
3.4	Managing paperwork and workspace Describe how to manage paperwork and your workspace to remain productive, efficient and organized. Describe the three basic rules for managing your workspace.
3.5	Meeting planning Discuss how to conduct an effective and efficient meeting.
3.6	Managing stress Explain how stress can be a major impact in time management. Describe the major causes of stress.
3.7	Computer applications Explain the benefits to sales professionals who utilize software databases to increase their sales efficiency.
4.0	**The Selling Process: Expanding upon the Six Step Process of selling in a manufacturing environment that is taught in the MT Sales Fundamentals program.**

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4.1	Introduction Describe how sales engineers, using the techniques and methods described earlier gather information and identify decision-makers, arrange a meeting and go about the business of making a sale. Review the MT sales fundamentals 6 step process.
4.2	Determining Customer Needs Explain the necessary steps in determining customer needs. Describe the five phases in buyer and seller customer relationships. Describe the different social styles that customers have.
4.3	Developing Sales Strategies Describe how to develop effective sales strategies. Explain the feature/benefit sales strategy.
4.4	Presenting products Explain the different presentation types and trends. Describe the three essential parts of a presentation.
4.5	Preparing and presenting proposals Describe how a proposal is prepared and what it includes, details on how the product or service will meet the customers needs.
4.6	Negotiations Describe the customer negotiation process. Explain the four items that sales people should know about the buyers and sellers position.
4.7	Closing orders Describe how closing the sale is an important part of the sales process. Explain how to resolve any open issues that your customer may have.
4.8	After-sale follow up Describe the importance of follow up once the sale is concluded.
5.0	**Business Practices, Manufacturing Economics and Ethics required of a professional sales engineer.**
5.1	Introduction Explain the general role of manufacturing in a business enterprise.

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	5.2	Glossary Review the glossary terms related to business practices, manufacturing economics, and ethics.
	5.3	Business Practices Describe how to serve the needs of customers, how to provide meaningful, safe employment to employees, how to make positive contributions in which the business is located, how to invest in the business for growth and increased value to employees, shareholders and customers.
	5.4	Machine and Equipment Investment Justification Describe the methods for justification of investment in new manufacturing technologies and the basic principles.
	5.5	Commercial Practice Describe how to attain the logical goal to have a satisfied customer with a manufacturing machine that meets or exceeds his needs.
	5.6	Business Ethics Explain what is integrity and the adherence to moral principles and character.
6.0	**Understanding of a wide range of universal, as well as emerging tools, tooling and manufacturing technologies and processes.**	
	6.1	Introduction Explain the vast changes in manufacturing in the last 100 years and how this has made American manufacturing the top producer of finished goods in the world.
	6.2	Glossary Review and become familiar with the manufacturing related terms.
	6.3	Manufacturing Processes Describe the principles of machining and achieving a finished workpiece.
	6.4	Manufacturing Systems Describe how manufacturing processes and philosophies have gone through a revolution of change.
	6.5	Manufacturing Software Explain manufacturing software that plans, schedules, manufactures, tracks, and ships products.

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7.0	**Computer Numerical Control (CNC) & Machine Control: Understanding of the impact of the programming and control functions that allow for increased machining efficiencies.**	
	7.1	Introduction Explain CNC machines and motion control.
	7.2	Glossary Review and become familiar with the manufacturing related terms.
	7.3	Computer Numerical Control Basics Describe what is Computer Numerical Control Basics.
	7.4	Machine Tools and their controls Describe what are machine tools and their controls.
	7.5	CNC Part Programming Explain CNC part programming, positioning, contouring and interpolation.
	7.6	Motion Control Technology Describe motion control on the devices and the machine tool that provides motion to the machine axes and spindles.
	7.7	PLC and sensor technology Explain Programmable Logic Controller (PLC) and how this is customized in the CNC for a specific machine application.
8.0	**Engineering Drawings & Geometric Dimensioning & Tolerancing (GD&T): Best practices in understanding part design to measured tolerance specifications.**	
	8.1	Introduction Explain the use of CAD software in product engineering.
	8.2	Glossary Review and become familiar with the manufacturing related terms.
	8.3	Understanding Engineering Drawings Explain how the engineering drawing is the communication tool between the designer and the manufacturing/assembly process.
	8.4	Understanding Geometric Dimensioning and Tolerancing Describe the ASME standard for dimensioning and tolerancing.

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	8.5	Surface Finish and Texture Explain how surface finish is specified on an engineering drawing and the attainable surface finish produced by various machining processes.
9.0	**Cutting Tool Technology: understanding of the types of cutting tools used across various machining processes, i.e. drill, mill, tap, etc.**	
	9.1	Introduction This module is intended to provide a brief overview of each topic.
	9.2	Glossary Review and become familiar with the manufacturing related terms.
	9.3	Workpiece Materials Explain workpiece materials and how they are selected based on their application. They fall into three categories: chemical, physical, and mechanical.
	9.4	Cutting Tool Materials Explain the ultimate success of the machining process and how that revolves around the events at the tool point. The characteristics of the tool material are therefore critical.
	9.5	Principles of Machining Describe the principles of machining.
	9.6	Basic Machining Processes Explain the term machining and the various machining processes.
	9.7	Workholding Considerations Explain what a Workholding device is and how it functions.
	9.8	Special Applications and Part Runoffs Describe traditional machining operations and the less prevalent, special applications machine operations.
	9.9	CNC Tool Management Explain how the CNC machine tool functions in the metal removing process.
	9.10	Abrasive Tools and Machining Explain the history of Abrasive machining process and its current machining application.

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9.11	Non-Traditional Machining Describe Laser Beam Machining (LBM), Water Jet or Hydrodynamic Machining, Electrical Discharge Machining (EDM), and Electrochemical Machining (ECM).
10.0	**Machine Tool Design: understanding of how machine design can impact best practice in part production to correct specifications.**
10.1	Introduction Explain what is machine tool design.
10.2	Glossary Review and become familiar with the manufacturing related terms.
10.3	Machine Construction and Materials Explain what structural components are in machines.
10.4	Guideway Design Describe guideway design and how this accommodates the axis movement of the machine slides, worktables, and spindles.
10.5	Spindle Bearing Design Explain spindle bearing design and the transmission of power to the spindle depends upon many factors.
10.6	Spindle Drives Describe how a spindle drive functions and how it provides the power necessary to rotate the tool or workpiece.
10.7	Machine Component Systems Describe the machine components, hydraulic and pneumatic, ball and leadscrew, gear train, and basic electrical systems.
10.8	Machine Tool Accessories Explain how the proper selection of accessories will make or break the success of a new machine tool installation.
10.9	Machine Tool Selection Factors Describe how each machine tool has a long list of features and specifications. However, there are key selection factors that are generally more important than others when sizing and selecting a machine.
10.10	Other Machine Designs and Processes Explain how to define the equipment or system utilized in Additive manufacturing.

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11.0	**Metalforming Technology: understanding of the basic types of metalforming machines and operations.**
11.1	Introduction Define metalforming and how this encompasses the metalworking processes of blanking, forming, stretching, shrinking, roll forming, spinning, bending, shearing, trimming, punching, drawing, stamping, extruding, upsetting, swaging, forging, and casting.
11.2	Glossary Review and become familiar with the manufacturing related terms.
11.3	Presses and Press Brakes Explain the selection of a press and how that will require a complete application study of the workpiece, process, and press specifications.
11.4	Roll Forming Describe what is roll forming, and how coiled stock can be formed into unique shapes by being fed between stations of upper and lower roll tooling that gradually shape the workpiece.
11.5	Shears Explain the shearing process and how this is the metalforming process.
11.6	CNC Turret Punch Presses Describe the CNC turret punch presses and how these punching operations include nibbling, notching, perforating, piercing, slotting, pointing, forming, and marking.
11.7	Forging Explain the forging process and how this is the oldest forms of metalworking.
12.0	**Machine Tool Accuracy: overview and understanding of the types of measuring tools and equipment used in dimensional measurement (metrology) of parts.**
12.1	Introduction Describe and provide a brief overview of measuring tools, Coordinate Measuring Machines, Machine Tool Accuracy, Workpiece Accuracy and Processing Considerations, Temperature Considerations, Accuracy Standards, Statistical Process Control (SPC).

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12.2	Glossary Review and become familiar with the manufacturing related terms.
12.3	Measuring Tools Explain how the Machine Tool Sales Engineer should have a basic knowledge of the measuring tools used in the inspection of machines and workpieces.
12.4	Coordinate Measuring Machines Describe how the coordinate measuring machines can perform almost all the functions of manual inspection devices in either a manual, semi-automatic, or full CNC mode.
12.5	Machine Tool Accuracy Explain how to measure machine tool accuracy and how this has improved significantly in the last 25 years.
12.6	Workpiece Accuracy and Processing Considerations Define machine tool accuracy and how this is reflected in the workpiece.
12.7	Temperature Considerations Explain the major environmental concern of temperature and how this can have an effect on machines and workpiece accuracy.
12.8	Statistical Process Control (SPC) Explain Statistical Process Control and how this process increases quality in manufacturing.
12.9	Summary Explain how the sales engineer who can talk fluently in the language of accuracy, measurements, and SPC will have a definite advantage over the competition.
13.0	**General Mathematics & Geometry required for part production and measurement.**
13.1	Introduction Describe the following sections: basic mathematics, geometry, metalworking math applications, unit measurement and conversions.
13.2	Glossary Review and become familiar with the manufacturing related terms.

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13.3	Basic Mathematics Explain how shop mathematics and geometry are necessary skills for the designer, machine operator, inspector, and sales engineer.
13.4	Geometry Define two dimensional and three dimensional geometric shapes.
13.5	Metalworking Math Applications Explain how the math skills in the metalworking environment covers a wide range.
13.6	Unit Measurement and Conversion Explain unit measurement and conversion and how every quantity, whether it be the length, speed, mass, volume, power, etc., is expressed in some standard unit of measure.