Learning Tool for Additive Manufacturing Machine and Material Selection

Given the proliferation of available additive manufacturing (AM) machines and materials, it is becoming increasingly difficult to select the right AM machine and material for a specific application. With over 1,500 industrial AM machines and materials covering 7 ASTM-defined AM manufacturing processes, how does a company choose which machine and material to work with?

Further compounding the difficulty and importance of selecting the right machine and material is the enormous cost of selecting the wrong machine or material. The cost of poor selection decisions can result in lost time and money, and in some cases, companies may abandon AM altogether if their initial decision is not right for them. It is not uncommon to hear about manufacturers who have AM machines sitting in the corner collecting dust because their purchase decision was not the right one for their needs.

The challenge of selecting the right AM machine and material for a given application impacts not only individual companies but also the industry as a whole. Therefore, it is important for those entering the AM industry to learn how to make a thoughtful, well-informed decision regarding AM machine and material selection.

One resource that exists to help with AM machine and material selection is the Senvol Database, which is a comprehensive database of additive manufacturing machines and materials. The Senvol Database is free to use and can be found at www.senvol.com/database.

The following two learning tool exercises will help guide you in the AM machine and material selection process. You will learn about various ways to narrow down the options, such as by analyzing machine and material compatibility, build envelope size, total cost of ownership, and mechanical properties.

Although the Senvol Database is used by both beginners and experts, the following two learning tool exercises are intended for beginners. For those who are new to AM, these learning tool exercises will help you begin to explore and understand the functionality of the Senvol Database and how to use it as a decision-making tool.

Learning Tool Exercise #1: Additive Manufacturing Machine Selection with the Senvol Database™

Intended For: Beginners. Examples of who might benefit from this exercise include:

- Undergraduate engineering students
- Employees at companies that are starting to explore additive manufacturing

Time: 15-30 minutes

Learning Objectives: After completing this exercise you should be able to:

- Know how to use and navigate the Senvol Database
- Understand key differences between the various AM machine and material offerings
- Apply decision-making metrics to select the right AM machine or material for a given application

Instructions:

- This exercise can be done individually or in small groups (2-4 people)
- Read the scenario below and work through the exercise questions at the end of the page

Scenario: The CEO of your company has recently asked you to explore the options for potentially purchasing an additive manufacturing machine. Your company is a tier 1 supplier for the aerospace industry and produces parts primarily made of titanium and nickel-based alloys. Your company does not have much experience with additive manufacturing, and so your CEO is relying on you to make an informed recommendation.

For this exercise, answer the questions below.

Resource: To help you answer the below exercise questions, use the Senvol Database, which is a comprehensive database of additive manufacturing machines and materials. The Senvol Database is free to use and can be found at www.senvol.com/database.

Exercise Questions:

1. What factors should you consider in making your recommendation? How would you prioritize these factors?
2. When using the Senvol Database, what were your search criteria? What was your rationale for using these search criteria?
3. Is there information not included in the Senvol Database that you would like to have known? If so, what?
4. Choose 2-3 machines that you think are the best fit for your company. Explain why you are recommending each of these machines.
5. Optional question for professionals: Has your company purchased an AM machine before? If so, what was that process like? What did you learn from that process? Is there any advice that you have for others who are getting ready to purchase an AM machine?

Learning Tool Exercise #2: Additive Manufacturing Material Selection with the Senvol Database™

Intended For: Beginners. Examples of who might benefit from this exercise include:

- Undergraduate engineering students
- Employees at companies that are starting to explore additive manufacturing

Time: 15-30 minutes

Learning Objectives: After completing this exercise you should be able to:

- Know how to use and navigate the Senvol Database
- Understand key differences between the various AM machine and material offerings
- Apply decision-making metrics to select the right AM machine or material for a given application

Instructions:

- This exercise can be done individually or in small groups (2-4 people)
- Read the scenario below and work through the exercise questions at the end of the page

Scenario: You work for a company that produces a widget via additive manufacturing. The widget is currently made of a PEEK material. However, due to a disruption in the global supply chain, you are no longer able to purchase any PEEK material. As a result, your company is now looking for an alternative material to PEEK. (Note: Assume that the widget must be made via additive manufacturing. Also assume that the price of the material is not of concern.)

For this exercise, answer the questions below.

Resource: To help you answer the below exercise questions, use the Senvol Database, which is a comprehensive database of additive manufacturing machines and materials. The Senvol Database is free to use and can be found at www.senvol.com/database.

Exercise Questions:

1. What factors should your company consider in finding a substitute material? How would you prioritize these factors?
2. When using the Senvol Database, what were your search criteria? What was your rationale for using these search criteria?
3. Is there information not included in the Senvol Database that you would like to have known? If so, what?
4. Choose 3-5 materials that you think are the best fit to replace the PEEK material. Explain why you are recommending each of these materials.