UNIVERSITY OF WISCONSIN OSHKOSH
College of Business
Business 343 – Manufacturing Planning and Control – Fall 2010
Section 1: Tuesday & Thursday, 8:00 AM – 9:30 AM, Nursing Ed 206
Section 2: Tuesday & Thursday, 9:40 AM – 11:10 AM, Nursing Ed 206
Dr. M. Godfrey, CFPIM, CIRM, C.P.M., CSCP, CPSM
Associate Professor, Supply Chain & Operations Management (SCOM)

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Program Assistant: Ms. Donna Molus, Clow Faculty 127, (920) 424-3027
Office Hours:            Wednesday: 9:00 AM – 11:45 AM
                        Tuesday & Thursday: 11:15 AM – 11:45 AM, 1:00 PM – 2:00 PM
                        Also by appointment.

Prerequisite: BUS 341

Required Texts:
Note: This is the primary text used for the APICS CPIM exams.

BUS 343 Course Packet of Notes & Handouts (in the bookstore).


Catalog Description
A study of manufacturing planning and control systems. Topics include an overview of supply chain management, manufacturing strategy, forecasting, sales and operations planning, resource requirements planning, master production scheduling, rough-cut capacity planning, material requirements planning, capacity requirements planning, Just-in-Time, constraints management, inventory principles, lot-sizing methods, and independent demand inventory management systems. Emphasis is placed on those planning and control functions performed within a given manufacturing firm.
Course Description

A study of manufacturing planning and control systems. Topics include an overview of supply chain management, manufacturing strategy, forecasting, sales and operations planning, resource requirements planning, master production scheduling, rough-cut capacity planning, material requirements planning, capacity requirements planning, Just-in-Time, constraints management, inventory principles, lot-sizing methods, and independent demand inventory management systems. In addition, students will be required to learn and apply different types of software, e.g., Excel spreadsheets, to problems built around the course topics.

Emphasis on Sustainability

We will explore the relationship between Manufacturing Planning & Control topics and sustainability through four exercises discussing the triple bottom line (economic, environmental, and social equity performance). Social equity performance is not as straightforward as the other two measures of the triple bottom line. To explain this measure further, Norman and MacDonald (2004) cited the following measures of social equity performance: diversity, union/industrial relations, health and safety, use of child labor, and improving the surrounding community.

Learning Objectives

At the end of this course, students will be able to:
1. Describe supply chain management.
2. Describe the formulation and elements of manufacturing strategy.
3. Describe the overall manufacturing planning process and the general relationships between the different levels of planning.
4. Understand the relationship between environmental sustainability and manufacturing planning & control.
5. Describe qualitative and quantitative forecasting techniques.
6. Determine which forecasting technique is appropriate for a given situation.
7. Use various forecasting techniques.
8. Describe the sales & operations planning (S & OP) process.
9. Describe how the sales & operations plan becomes an input to the master schedule.
10. Explain the concepts of independent and dependent demand.
11. Describe bills of material.
12. Define the role of the master scheduler.
13. Distinguish between a master schedule and a master production schedule.
14. Develop a master production schedule and determine its feasibility.
15. Apply the concept of available-to-promise in a master scheduling environment.
16. Describe how the tradeoffs in the balancing of supply and demand are at the core of master scheduling and how they are resolved.
17. Define time fences and their use.
18. List the differences between the final assembly schedule and the master production schedule.
19. Show how the master production schedule is the primary driver for material requirements planning and rough-cut capacity planning.
20. Define the role of rough-cut capacity planning in testing for master production schedule feasibility.
21. Explain the elements of lead-time.
22. Demonstrate a working knowledge of material requirements planning.
23. List the data required for routing and explain the need for data accuracy.
24. Demonstrate how to calculate load and capacity in capacity requirements planning.
25. Describe the relationships between production activity control and other production areas.
26. Describe the activities of releasing an order.
27. Explain the treatment of start dates and due dates in dispatching.
29. List the functions of inventory.
30. Define inventory terminology.
31. List the different classifications of inventory.
32. Use common lot-sizing techniques.
33. Develop an inventory system appropriate for a given set of circumstances.
34. Describe how inventory measurement and control techniques affect costs and services.
35. List the purpose of the various inventory measurement and control techniques.
36. Describe alternatives that may be considered in efforts to optimize customer service, inventory investment, operations, profitability, and return on investment.
37. Describe the main concepts of Just-in-Time/Lean as they relate to manufacturing strategy and the planning and control system.
38. Use a value stream map to determine lead-time reduction opportunities.
39. Describe the main concepts of constraints management as they relate to manufacturing strategy and the planning and control system.

Assessment

For assessment purposes, objectives have been defined for all undergraduate business students and for each major. The objectives that are pertinent to 28-343 are the two that are specific to operations management major courses as follows:

**Objective 1:** BBA graduates with an operations management major will have knowledge of specific mathematical and behavioral models important to the effective management of operations.

**Objective 2:** BBA graduates with an operations management major will demonstrate knowledge of the range of operation types, practices, and problem solving techniques appropriate to manufacturing planning and control.

**APICS** has five modules for the CPIM (Certified in Production and Inventory Management) program as follows: Basics of Supply Chain Management, Master Planning of Resources, Detailed Scheduling and Planning, Execution and Control of Operations, and Strategic Management of Resources. The Basics of Supply Chain Management module covers basic
concepts in managing the flow of materials from suppliers to final customers. It is meant to serve as an overview of the material covered in the other modules and should be taken first. The other modules go into more depth on important aspects of production planning and control. Together Manufacturing Planning & Control Systems (Business 343) and Supply Chain Management (Business 344) cover most of the body of knowledge for the CPIM. BUS 343 concentrates most heavily on most of the material included in the Master Planning of Resources and Detailed Scheduling and Planning modules and covers part of the Supply Chain Management, Strategic Management of Resources, and Execution and Control of Operations modules.

**Note:** If you have questions about grading, any concerns regarding your performance in the class, or any personal issues that you need to discuss with me, you must come in during office hours to talk to me. E-mail is NOT an effective way to discuss these issues.

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**Professional Development Activities**

There are several opportunities available for professional development limited to APICS club meetings on the UW Oshkosh campus, tours sponsored by APICS, APICS meetings held by the Fox Valley chapter, ISM (formerly NAPM) meetings held by the Fox Valley Chapter, and meetings held by the Northeast Wisconsin Council of Supply Chain Management. **Exceptions to this policy must be pre-approved by the instructor.** You are to participate in two professional development activities during the semester and hand in a brief (one- to two-page, double-spaced) memo on what you learned from each activity. You must turn in the memo within 1 week of the event. **A list of meetings will be posted on D2L.**

A second alternative for completing the professional development assignment is to participate in a job shadow exercise. Requirements for this alternative are provided below:

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**JOB SHADOW PROGRAM**
**UNIVERSITY OF WISCONSIN OSHKOSH**

Students will be provided the option of fulfilling their professional development requirement for this course by observing operations management professionals (mentors) in action. Specifically, the students will be seeking to shadow those professionals whose duties include any of the following: sales & operations planning, master scheduling, material requirements planning, capacity management, production activity control, inventory control, forecasting, or ERP system implementation. Students will be working in groups of two to observe an operations management mentor over a two to three hour period. Each student will then be required to complete a three-page report about what he/she observed and how those observations relate to concepts from the course.
Course Evaluation

<table>
<thead>
<tr>
<th>Source</th>
<th>Number</th>
<th>Points</th>
<th>Total Points</th>
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<tbody>
<tr>
<td>Exams</td>
<td>3</td>
<td>100, 100, 150</td>
<td>350</td>
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<tr>
<td>Sustainability</td>
<td>4</td>
<td>20, 20, 30, 20</td>
<td>90</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
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<tr>
<td>Vocabulary</td>
<td>3</td>
<td>15 each</td>
<td>45</td>
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<td>Quizzes</td>
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<tr>
<td>PDM</td>
<td>2</td>
<td>7.5 each</td>
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<tr>
<td>Total</td>
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<td>500</td>
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Exam 3 will be cumulative.

- The terms and definitions for the vocabulary quizzes are posted on D2L.

The following grade scale will be used:

<table>
<thead>
<tr>
<th>(%)</th>
<th>Grade</th>
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<tbody>
<tr>
<td>(93-100%)</td>
<td>A</td>
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<td>(90-92.99%)</td>
<td>A-</td>
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<td>(87-89.99%)</td>
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<td>(83-86.99%)</td>
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<td>(80-82.99%)</td>
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<td>(77-79.99%)</td>
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<td>(73-76.99%)</td>
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<td>(63-66.99%)</td>
<td>D</td>
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<tr>
<td>(60-62.99%)</td>
<td>D-</td>
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<tr>
<td>(&lt; 60%)</td>
<td>F (Failure)</td>
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**Note: I do not curve.**

Classroom/Course Policies

Exam and Quizzes:

1. Exams will have two parts: a conceptual questions part and a problems part.
2. You may **not** bring any study aids to the exam. **I will provide you a calculator and a formula sheet.**
3. The exams will consist of multiple-choice questions, short answer questions, and problems selected from homework, readings, lecture, and class discussion. No sharing of calculators is permitted during exams. Students are not allowed to
leave the classroom during an exam or quiz unless they are prepared to turn in their exam or quiz before leaving.

**Group Assignments:**

- Group assignments are to be completed by your group members only without any consultation with other groups. The Harvard Business School case analysis is the only exercise that could be completed in a group (**maximum size of 5**).
- **Note:** I do not consider hand-written work when grading. Furthermore, I grade for content and grammar/spelling.

**Policy Regarding Makeup Exams/Quizzes and Late Assignments:**

- No makeup exams/quizzes will be given or late assignments accepted unless the student provides valid documentation of a business meeting or illness to the instructor. Assignments are due at the beginning of class on the scheduled date. If you will miss an assignment or an exam, you should contact me by telephone or e-mail prior to your absence if physically possible and then provide documentation to me upon your return to campus. In general, I accept the following types of excuses: (a) You must make an unscheduled visit to the doctor’s office or hospital due to an unforeseen illness or injury, (b) You have to attend some type of memorial service for someone in your immediate family, or (c) You are required to attend a work function. Examples of excuses that would be unacceptable would include, but not be limited to, the following: (a) You have a job interview or (b) You did not have enough sleep the night prior to the date of the assignment or exam. I will analyze all excuses on a case-by-case basis. If the excuse cannot be documented, it is unacceptable. The format of makeup exams is at the instructor’s discretion and will vary significantly from the regular exam given in class.

**General Class Conduct Guidelines:**

- All exams, quizzes, and graded assignments will be reviewed briefly in class. During the review of an exam, quiz, or assignment, you will not be permitted to take any notes or to write on the documents. After we have completed our review, you must return all documents to me. If you fail to turn in all documents to me before leaving the classroom, you will receive a grade of zero on that exam, quiz, or assignment. In short, I keep all copies of graded materials.
- Students may ask questions about graded exams or assignments at the end of class. This allows me to provide you my undivided attention.
• Students are expected to complete reading assignments prior to class, to be prepared to discuss the material in class, and to participate in class discussions.

• Students are expected to listen attentively when the instructor or other students are speaking. I run class like a business meeting. Therefore, respect for others in class is of paramount importance. I am very direct and swift in addressing disrespectful behavior in the classroom.

**Cheating and Plagiarism:**

• Students involved in cheating and plagiarism are subject to the maximum penalties permitted by the UW Oshkosh Student Discipline Code.
<table>
<thead>
<tr>
<th>Date</th>
<th>Topics Covered</th>
<th>Assignments</th>
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</thead>
<tbody>
<tr>
<td>Thursday (9/9)</td>
<td><strong>Pre-test.</strong> Overview of Supply Chain Management, Manufacturing Strategy, and Manufacturing Planning &amp; Control. Introduction to Lean &amp; Value Stream Mapping.</td>
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<tr>
<td>Tuesday (9/14)</td>
<td>Lean &amp; Value Stream Mapping (continued). Example of Lean in Complex Manufacturing; P &amp; H video.</td>
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<tr>
<td>Thursday (9/16)</td>
<td>Forecasting.</td>
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<tr>
<td>Tuesday (9/21)</td>
<td>Sales &amp; Operations Planning (S &amp; OP).</td>
<td><strong>Sustainability Exercise 1 is due.</strong></td>
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<tr>
<td>Thursday (9/23)</td>
<td>Master Scheduling.</td>
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<tr>
<td>Tuesday (9/28)</td>
<td>Master Scheduling continued.</td>
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<tr>
<td>Thursday (9/30)</td>
<td><strong>Vocabulary Quiz 1.</strong> Wrap-up &amp; review for Exam 1.</td>
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<tr>
<td>Tuesday (10/5)</td>
<td><strong>Exam 1:</strong> Sections 1 – 4 in course packet.</td>
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<tr>
<td>Date</td>
<td>Topics Covered</td>
<td>Assignments</td>
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<tr>
<td>Thursday (10/7)</td>
<td>Discuss graded exams. Material Requirements Planning (MRP).</td>
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<tr>
<td>Tuesday (10/12)</td>
<td>MRP (continued).</td>
<td><strong>Sustainability Exercise 2 is due.</strong></td>
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<tr>
<td>Thursday (10/14)</td>
<td>MRP (continued).</td>
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<td>Thursday (10/21)</td>
<td><strong>Vocabulary Quiz 2.</strong> RCCP &amp; CRP continued.</td>
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<td>Tuesday (10/26)</td>
<td>RCCP &amp; CRP continued.</td>
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<td>Thursday (10/28)</td>
<td>RCCP &amp; CRP continued.</td>
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<tr>
<td>Tuesday (11/2)</td>
<td>Production Activity Control (PAC).</td>
<td><strong>Sustainability Exercise 3 is due.</strong></td>
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<td>Thursday (11/4)</td>
<td>PAC continued.</td>
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<tr>
<td>Tuesday (11/9)</td>
<td><strong>Exam 2: Sections 5 – 7 in course packet.</strong></td>
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<td>Tuesday (11/16)</td>
<td>Just-in-Time Manufacturing/Lean continued.</td>
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<td>Thursday (11/18)</td>
<td>Introduction to the Theory of Constraints (TOC).</td>
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<tr>
<td>Date</td>
<td>Topics Covered</td>
<td>Assignments</td>
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<tr>
<td>Tuesday (11/23)</td>
<td>TOC continued.</td>
<td>Note: We may have to cancel class if I have to attend the DSI conference.</td>
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<tr>
<td>Thursday (11/25)</td>
<td>No class—university holiday.</td>
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<tr>
<td>Tuesday (11/30)</td>
<td>TOC continued.</td>
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<tr>
<td>Thursday (12/2)</td>
<td>Inventory Fundamentals. Order Quantity Models.</td>
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<tr>
<td>Tuesday (12/7)</td>
<td>Vocabulary Quiz 3. Independent Demand Inventory Systems.</td>
<td>Sustainability Exercise 4 is due.</td>
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<tr>
<td>Tuesday (12/14)</td>
<td>Exam 3: Sections 8 – 10 in course packet (plus previous material from Exams 1 &amp; 2)</td>
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<td>Thursday (12/16)</td>
<td>Alternate date for Exam 3.</td>
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Sustainability Exercises

Exercise 1: Environmental Performance: The Paper Industry
Individual Assignment

Learning Objectives:

1. Students will learn how paper is manufactured.
2. Students will learn about the hazards of the continued use of toxic chemicals (e.g., chlorine and chlorine dioxide) in paper manufacturing.

Instructions:

1. Visit the Idaho Forest Product Commission’s web site, “How Paper is Made,” to learn about the paper manufacturing process:

   http://www.idahoforests.org/paprmake.htm

2. Visit the following web sites to learn about the dangers of the use of toxic chemicals in paper manufacturing:

   http://www.cwac.net/paper_industry/


   Conservatree, “Chlorine Free Processing,”
   http://www.conservatree.org/paper/PaperTypes/CFDisc.shtml

3. Type a 2 – 3 page report (double-spaced with one-inch margins) and include a title page followed by your report. You should answer the questions shown below:

   a. What are the steps in paper manufacturing?
   b. What are the dangers posed by the chemicals used in the paper manufacturing process?
   c. As a citizen of Wisconsin, what actions (if any) do you think the paper companies in Wisconsin should take to reduce the dangers posed by the use of toxic chemicals? What are your top two recommendations? Explain why.
Exercise 2: Triple Bottom Line Performance in Operations Management:
Article Summaries
Individual Assignment

Learning Objectives:

1. Students will read two articles related to the triple bottom line. The first article, “Sustainable Operations Management,” relates all three elements of the triple bottom line to operations management. The second article, “Mind the Gap: A Journey to Sustainable Supply Chains,” discusses social equity issues (labor standards).

2. Students will summarize the relationship between operations management and the triple bottom line.

Instructions:

1. Type a 2 – 3 page report (double-spaced with one-inch margins) and include a title page followed by your report. You should answer the questions shown below:

   a. According to the article, “Sustainable Operations Management,” how does operations management affect the three elements of the triple bottom line?
   b. What were the primary labor issues discussed in the second article, “Mind the Gap: A Journey to Sustainable Supply Chains?” How might you consider those issues when developing a sales and operations plan (S&OP)?
Exercise 3: Economic and Environmental Performance:
Harvard Business School Case 9-608-055: Cook Composites and Polymers Co.

Learning Objectives:

1. Students will learn about the manufacturing process for a chemical compound (gel coat) and analyze the economic and environmental implications of the use of a chemical (styrene) used to clean equipment between production batches of the chemical compound.

2. Students will learn and demonstrate how to conduct economic and environmental analyses of alternative uses for a waste product.

Instructions:

1. Type a 2 – 3 page analysis (double-spaced with one-inch margins) and include a title page followed by your analysis. You must show your work on quantitative questions to receive any credit on those questions. You should answer the case questions shown below:

   a. For what purposes are gel coat and styrene used? Why does the EPA consider waste styrene a hazardous waste?

   b. What are the processing steps and the average processing time to produce a batch in a mixing vessel? Hint: Your answer should be 6 hours per batch. Show your calculations to derive the average value of 6 hours per batch. Remember: 50% of the batches require two rounds of mixing and quality assessments, and 50% of the batches require three rounds of mixing and quality assessments.

   c. What is the annual capacity stated in batches of gel coat? Remember: the plant shuts down for 2 weeks per year.

   d. Use Case Exhibit 5 and the cost information in the case to determine the optimal number of pounds of styrene to use to clean a vessel. The optimal number of pounds of styrene to use should be based on the expected net profit per batch of gel coat.

   We know the following:

   - One drum of gel coat contains 55 gallons and weighs 550 pounds (55 gallons/drum * 10 pounds/gallon). Note: Styrene and gel coat weigh the same amount per gallon.

   - A batch of gel coat includes 10-drums of gel coat (550 gallons or 5500 pounds).

   - Gel coat sells for an average price of $1/pound ($10/gallon).

   - Currently 550 pounds of styrene are used after a batch is processed.
- When 550 pounds of styrene are used, on average 99.59% of the batches are conforming. The **expected** revenue per batch of gel coat when 550 pounds of styrene are used is 5500 pounds * 0.9959 * $1/pound = $5477.45.

- The material cost of the styrene = $0.70/pound.

- **The styrene disposal cost** = $0.20/pound.

- The cost of goods sold for a batch of gel coat (excluding the styrene material cost and disposal cost) when 550 pounds of styrene are used is $4620 - $385 - $110 = $4125. The value of $4620 was given on p. 4 of the case.

e. What are by-product synergies?

f. The company is considering producing a concrete coating using its waste styrene. The gross profit on this waste styrene would equate to $0.20 per pound of concrete coating (or $0.40 per pound of styrene). Use Case Exhibit 5 and the cost information in the case to determine the optimal number of pounds of styrene to use to clean a vessel when the waste styrene is used to manufacture concrete coating. The optimal number of pounds of styrene to use should be based on the **expected** net profit per batch of gel coat.

g. If the company chooses to use the waste styrene to produce concrete coating, what will the increase in annual net profit equal? What is the payback period for this $3M investment?

h. Cook Composites is currently shipping its waste styrene to a cement kiln that uses the waste styrene to replace some of its use of fossil fuels. The following questions require you to use Exhibit 9 in the case.

How do the emissions of CO$_2$ change at the cement kiln if Cook Composites stops shipping its waste styrene to the cement kiln and, instead, uses the waste styrene to manufacture concrete coating?

Answer: If the cement kiln has to switch back to fossil fuels to replace the waste styrene, then its emissions would increase by 0.06 (0.025 – 0.19) pounds of CO$_2$ per pound of cement produced. We must restate this value in terms of styrene as follows:

0.06 pounds of CO$_2$/1 pound of cement * 20 pounds of cement/1 pound of styrene = 1.2 pounds of CO$_2$ produced/pound of styrene not shipped to the kiln (this relationship holds up to the original value of 550 pounds of styrene per batch).
How do the emissions of CO₂ change in the concrete coating process if Cook Composites stops shipping its waste styrene to the cement kiln and, instead, uses the waste styrene to manufacture concrete coating?

How do the emissions of CO₂ change in the gel coat process if Cook Composites stops shipping its waste styrene to the cement kiln and, instead, uses the waste styrene to manufacture concrete coating?

Compare the current use of waste styrene to the proposed change using waste styrene to manufacture concrete coating (assuming that Cook will use the optimal number of pounds of styrene calculated in part (d) above):

What is the net effect per batch of gel coat produced (stated as pounds of CO₂ per batch of gel coat produced)? What is the amount of annual emissions reduction based on the plant’s annual capacity of gel coat?
Exercise 4: Environmental and Social Equity Performance: KellerOnLine® Safety Introduction

Learning Objectives:

1. Students will learn about safety issues related to environmental performance.
2. Students will learn about safety issues related to social equity performance.

Instructions:

1. Students will access the KellerOnline® - Education web site at:
   https://www.kelleronline.com/education/

2. Students will learn about safety issues related to environmental and social equity performance by watching videos and/or reading text-based material on this site. Students will access the videos and/or readings by logging into the KellerOnline® - Education web site using the information provided on the D2L site for this course. After logging into the system, students should go to the “Learning Center, and then to “Employee Training Videos – Workplace Safety” to watch the following videos (or to read the text version if preferred):

   (a) “Beware of electrical hazards”
   (b) “Learn the basics of fire safety”
   (c) “What can you learn from material safety data sheets?”
   (d) “What’s my part in the hearing conservation program?”
   (e) “Ergonomics on the job”
   (f) “What are the steps in a lockout/tagout procedure?”
   (g) “Types of lockout/tagout equipment”
   (h) “PPE selection depends on the job”
   (i) “Respirators protect your health”

3. Students will type a 2 – 3 page report (double-spaced with one-inch margins) and include a title page followed by your analysis. Students should answer the case questions shown below:

   a. How much electrical current is necessary to kill someone? What types of injuries can electricity cause?
   b. What are the different classes of fires and how are they best extinguished?
   c. What information is included on a Material Safety Data Sheet?
   d. As a manager, what will be your role in preventing employee hearing loss?
   e. What are ergonomic solutions to musculoskeletal problems caused by some factory jobs?
   f. What are the steps in a lockout/tagout procedure? What are alternatives to tags and locks?
g. What is PPE? What are some examples of PPE equipment and why are they used? Why would a factory worker use a respirator?

References


