

24. Oregon Fiber Board makes roof liners for the automotive industry. The manufacturing manager is concerned about product quality. She suspects that one particular failure, tears in the fabric, is related to production-run size. An assistant gathers the following data from production records:

Run	Size	Failures (%)	Run	Size	Failures (%)
1	1,000	3.5	11	6,500	1.5
2	4,100	3.8	12	1,000	5.5
3	2,000	5.5	13	7,000	1.0
4	6,000	1.9	14	3,000	4.5
5	6,800	2.0	15	2,200	4.2
6	3,000	3.2	16	1,800	6.0
7	2,000	3.8	17	5,400	2.0
8	1,200	4.2	18	5,800	2.0
9	5,000	3.8	19	1,000	6.2
10	3,800	3.0	20	1,500	7.0

- Draw a scatter diagram for these data.
 - Does there appear to be a relationship between run size and percent failures? What implications does this data have for Oregon Fiber Board's business?
25. Grindwell, Inc., a manufacturer of grinding tools, is concerned about the durability of its products, which depends on the permeability of the sinter mixtures used in production. Suspecting that the carbon content might be the source of the problem, the plant manager collected the following data:

Carbon Content (%)	Permeability Index
5.5	16
3.0	31
4.5	21
4.8	19
4.2	16
4.7	23
5.1	20
4.4	11
3.6	20

- Draw a scatter diagram for these data.
 - Is there a relationship between permeability and carbon content?
 - If low permeability is desirable, what does the scatter diagram suggest with regard to the carbon content?
26. The operations manager for Superfast Airlines at Chicago's O'Hare Airport noticed an increase in the

number of delayed flight departures. She brainstormed possible causes with her staff:

- Aircraft late to gate
- Acceptance of late passengers
- Passengers arrive late at gate
- Passengers processing delays at gate
- Late baggage to aircraft
- Other late personnel or unavailable items
- Mechanical failures

Draw a cause-and-effect diagram to organize the possible causes of delayed flight departures into the following major categories: equipment, personnel, material, procedures, and "other factors" beyond managerial control. Provide a detailed set of causes for each major cause identified by the operations manager, and incorporate them in your cause-and-effect diagram.

27. Plastomer, Inc. specializes in the manufacture of high-grade plastic film used to wrap food products. Film is rejected and scrapped for a variety of reasons (e.g., opacity, high carbon content, incorrect thickness or gauge, scratches, and so on). During the past month, management collected data on the types of rejects and the amount of scrap generated by each type. The following table presents the results:

Type of Failure	Amount of Scrap (lbs.)
Air bubbles	500
Bubble breaks	19,650
Carbon content	150
Unevenness	3,810
Thickness or gauge	27,600
Opacity	450
Scratches	3,840
Trim	500
Wrinkles	10,650

Draw a Pareto chart to identify which type of failure management should attempt to eliminate first.

28. Management of a shampoo bottling company introduced a new 13.5-ounce pack and used an existing machine, with some modifications, to fill it. To measure filling consistency by the modified machine (set to fill 13.85 ounces), an analyst collected the following data (volume in ounces) for a random sample of 100 bottles:
- Draw a histogram for these data.
 - Bottles with less than 12.85 ounces or more than 14.85 ounces are considered to be out of specification. Based on the sample data, what percentage of the bottles filled by the machine will be out of specification?