15.521 Managerial Accounting and Control

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MDD

What is the competitive environment MDD faces?

- Product market is extremely price sensitive.
- It is a captive supplier for its parent company.
  - Provides 40% of parent’s chip requirement.
- It only produces proprietary chips.
- It is not a low cost producer.
  - When a chip becomes a commodity, it is outsourced.
- It depends on technology transfers from competitors in exchange for commodity chip volume.
MDD

- What is the production process at MDD?
  - Silicon wafers are purchased.
  - Passed through the Fabrication department where IC’s are made.
  - Wafers are diced into chips in the Assembly department, and packaged.
  - Chips undergo final testing.

- What is MDD’s cost structure?
  - 8% direct materials.
  - 15% direct labor.
  - 77% overhead.
    - 65% of overhead is fixed.
MDD

- What is the issue currently confronting MDD?
  - What to do with the excess capacity – should more chips be insourced?
    - How should these insourced chips be costed, for pricing purposes?
  - How was this excess capacity created?
    - Long-term yield improvements.
    - Short term yield variability.
    - Product mix changes due to declining demand for certain process families.
    - Lumpy capacity.
MDD

How would insourcing help MDD?
- Spread fixed costs over more volume.
- Quality improvements due to increased wafer cleanliness with continuous production at higher volumes.
- Credible threat of insourcing would provide incentive to other suppliers to lower prices.

What are the different capacity costing alternatives?
- The question essentially is what number to use in the denominator in calculating the overhead allocation rate.
Assume all overhead is fixed, and that it is $12m annually.
Consider the following alternative denominators.

<table>
<thead>
<tr>
<th>Capacity Defn.</th>
<th>Units</th>
<th>Allocation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical</td>
<td>120000</td>
<td>100</td>
</tr>
<tr>
<td>Practical</td>
<td>100000</td>
<td>120</td>
</tr>
<tr>
<td>Normal</td>
<td>80000</td>
<td>150</td>
</tr>
<tr>
<td>Budgeted</td>
<td>75000</td>
<td>160</td>
</tr>
</tbody>
</table>
Suppose we use practical capacity, and this year’s sales turn out to be 80k units. How much of the fixed cost is recovered through product prices?

- $120 \times 80k \text{ units} = $9.6m

Using practical capacity, how many units need to be sold to recover all fixed costs?

- Exactly 100k

If actual sales are 80k units, what happens to the remaining $2.4m of overhead?

- The company still has to pay this $2.4m, but customers are not forced to pay through higher prices (or a higher allocation rate).
- This $2.4m is the cost of excess capacity.

So at issue in choosing a capacity definition is whether customers should pay for the excess capacity.
But what is excess, i.e., what is the benchmark level of full capacity?

Theoretical capacity?
- Under this definition, the allocation rate would be $100/unit. If sales are 100k (practical capacity) then $10m is recovered from product costs. Is the remaining $2m the cost of excess capacity?
  - No, since theoretical capacity is unattainable.
  - If we use theoretical capacity as the denominator, we will always erroneously identify some fixed costs as due to ‘excess capacity.’

Practical capacity?
- This seems reasonable, since it is attainable.
- So it would be correct to use practical capacity as the denominator.
What else can we use as the denominator in calculating the overhead allocation rate?

- Normal utilization, which is the average expected volume over the next three or five years.
- Budgeted utilization, which is the expected volume over the next (one) year.

Capacity is acquired with the expectation that it will be used.

Therefore, the normal utilization (or utilization over longer periods) will generally approach practical capacity.
However, as in MDD, normal utilization may drop well below practical capacity due to learning and process improvements (e.g., increasing long term yields).

Suppose we use normal utilization as the denominator. The allocation rate will be $150 per unit, and prices will be higher accordingly (under cost-based pricing).

- Sales will be 80k x 3 = 240k units over the next three years.
- Total overhead will be $12m x 3 = $36m over the next three years.
- Overhead recovered through products = $150 x 240k units = $36m over the next three years.
- Customers have been charged all the overhead.

If practical capacity had been used, customers would have been charged $120 x 240k units = $28.8m, and MDD would have paid (or absorbed) the $7.2m cost of excess capacity.
Should MDD use Normal utilization as the denominator?
- No, this would not be sustainable in a competitive product market. (Remember that commodity chips will be insourced).
- Competitors who do not have the excess capacity will be able to charge less and gain customers.

The same problem applies in using budgeted utilization as the denominator. In this case, the allocation would be $160 per unit, which is even higher.

In addition, using budgeted utilization will cause cost estimates, and prices, to fluctuate from year to year.
- Some argue that using budgeted utilization is useful for control, but this is debatable.
Using budgeted utilization could lead to another problem.

Suppose sales are expected to be low next year, so that budgeted utilization is 60k units. The allocation rate is now $200 per unit, and prices will be increased accordingly.

Should you increase prices when demand drops?
- No! Remember the death spiral.

Using budgeted utilization as the denominator will send the wrong signal to marketing managers. Seeing a higher unit cost, they will be tempted to raise prices at exactly the wrong time.
So we are going to use practical capacity as the denominator.

Now what do we do with the cost of excess capacity (the $2.4m in our example)?

This depends on the reason for the excess capacity.

Consider first the excess capacity due to short term yield variability at MDD.

This should be charged to the product!

This excess capacity is required by the production process. It is an unavoidable cost of production, even for existing competitors and potential new entrants.
Now consider the excess capacity due to increasing long term yields.

This is avoidable by a new entrant into the industry, so it should not be charged to the product.

The cost of this excess capacity should be separated from the product cost, and shown to managers separately, as in the Insteel case.

Separating the cost of excess capacity:
- draws managerial attention, and
- prevents erroneous actions (death spiral, etc.).
What about the capacity created by product mix changes?

Ideally, the life of the process family (e.g., three years) should have been forecasted at birth, and the denominator should have been the average volume over the life of the family.

This would have allowed full cost recovery for each process family over its life.

If this was not done, it is unlikely the cost can now be recovered through a higher allocation rate and higher prices.
  - Raising prices is likely untenable when the demand for a process family is declining.
What about excess capacity due to lumpy resources?

These might be an inherent cost of the production process and therefore unavoidable.

If so, they can be charged to the product.

Excess capacity can arise in yet another way. Consider Ibiza Airlines.

It serves 16k passengers in each of the summer months, but only 8k in any other month.

Ibiza has long term leases for its aircraft.

Aircraft not used in non-summer months represent excess capacity in those months.

Who should pay for the cost of this excess capacity?
This capacity is demanded by, or due to, summer travelers, so they should pay for it.

Competing airlines are likely to face the same capacity constraints in the summer months, so raising prices for summer travelers may not be harmful.

Allocating higher costs to, and raising prices for, non-summer travelers will not work because:

- The signal from the cost system will be that summer travelers are cheaper, and managers will try to attract more summer travelers, thereby only raising the costs of excess capacity.
- Competing airlines with reduced summer service levels will be able to offer lower prices to non-summer travelers, because they won’t have the extra capacity.
This is consistent with peak-load pricing, which is the practice of charging higher rates when demand approaches capacity.

- Peak-load pricing is observable in, e.g., the telecom, hotel and car rental industries.
- An alternative explanation for peak-load pricing is price discrimination.

As another example, if excess capacity is required to service a large customer with variable demand, then that customer should be charged the cost of the resulting excess capacity.
MDD is related to other cases we have covered, e.g., Bridgeton, Insteel, Colorscope.

Takeaways:

- In a competitive product market, consumers will not pay for any discretionary excess capacity.
- Deviations from practical capacity can be regarded as excess capacity.
- In general, the cost of excess capacity should be separated from product costs and highlighted, to prevent erroneous decisions and to focus managerial attention on the issue.
- Excess capacity demanded by the product (i.e., an excess capacity cost that is inherent in the production process) should be charged to the product.
- Excess capacity demanded by a customer (i.e., due to the customer’s buying pattern) should be charged to the customer.