**Problem Statement**

Which semiconductor foundry exhibits the best balance of production efficiency, cost management, and order fulfillment capacity?

**Foundry Performance and Efficiency Analysis:**

In the semiconductor industry, where production speed, cost efficiency, and the capacity to fulfill orders are crucial, assessing the overall performance of a foundry is essential. This involves considering not only how quickly and cost-effectively a foundry can produce chips but also its ability to handle and complete customer orders. The following metrics are crucial for this analysis:

**Production Efficiency Rate:** This measures the average number of chips produced per day, indicating the foundry's production speed and capacity.

**Cost Efficiency Ratio:** This ratio reflects how cost-effectively the foundry operates, calculated by dividing the total production cost by the average production time in days. It provides insight into the foundry's cost management relative to its production timeline.

**Foundry Efficiency Ratio:** A crucial metric for this analysis, calculated by dividing the Production Efficiency Rate by the Cost Efficiency Ratio. A higher ratio suggests a better balance between production speed and cost-effectiveness, indicating a more efficient overall operation.

**Total Orders:** Reflects the foundry's market demand and capacity to handle customer orders, with a higher number of orders possibly indicating better market trust and operational capability.

This analysis aims to identify which foundry not only operates efficiently in terms of production and cost but also effectively manages customer demands. It is invaluable for stakeholders to understand which foundry offers the best balance of these aspects, guiding strategic decisions, investments, and operational improvements in the highly competitive semiconductor industry.

**SQL Code**

SELECT F.Name as Foundry\_Name,

COUNT(DISTINCT PO.Order\_ID) as Total\_Orders,

COUNT(DISTINCT C.Chip\_ID) as Total\_Chips,

ROUND(AVG(DATEDIFF(PK.Date, PO.Date))) as Average\_Production\_Time\_Days,

SUM(CPC.Production\_Cost\_Per\_Chip) as Total\_Production\_Cost,

ROUND(SUM(CPC.Production\_Cost\_Per\_Chip) / AVG(DATEDIFF(PK.Date, PO.Date)), 4)

as Cost\_Efficiency\_Ratio,

COUNT(DISTINCT C.Chip\_ID) / AVG(DATEDIFF(PK.Date, PO.Date))

as Production\_Efficiency\_Rate,

(COUNT(DISTINCT C.Chip\_ID) / AVG(DATEDIFF(PK.Date, PO.Date))) /

(SUM(CPC.Production\_Cost\_Per\_Chip) / AVG(DATEDIFF(PK.Date, PO.Date)))

as Foundry\_Efficiency\_Ratio

FROM Foundry F

JOIN Testing T ON F.Foundry\_ID = T.Foundry\_ID

JOIN Testing\_ON TON ON T.Testing\_ID = TON.Testing\_ID

JOIN Chip C ON TON.Chip\_ID = C.Chip\_ID

JOIN ( SELECT C.Chip\_ID,

(CS.Cost + Tech.Cost + NC.Cost + CM.Cost + P.Cost) as Production\_Cost\_Per\_Chip

FROM Chip C

JOIN Design D ON C.Design\_ID = D.Design\_ID

JOIN Clock\_Speed CS ON D.CS\_ID = CS.CS\_ID

JOIN Technology Tech ON D.Tech\_ID = Tech.Tech\_ID

JOIN Num\_Core NC ON D.Core\_ID = NC.Core\_ID

JOIN Cache\_Memory CM ON D.Cache\_ID = CM.Cache\_ID

JOIN Power P ON D.Power\_ID = P.Power\_ID

) CPC ON C.Chip\_ID = CPC.Chip\_ID

JOIN Purchase\_Order PO ON C.Order\_ID = PO.Order\_ID

JOIN WaferBatch WB ON C.Batch\_ID = WB.Batch\_ID

JOIN Packaging PK ON C.Chip\_ID = PK.Chip\_ID

GROUP BY F.Name

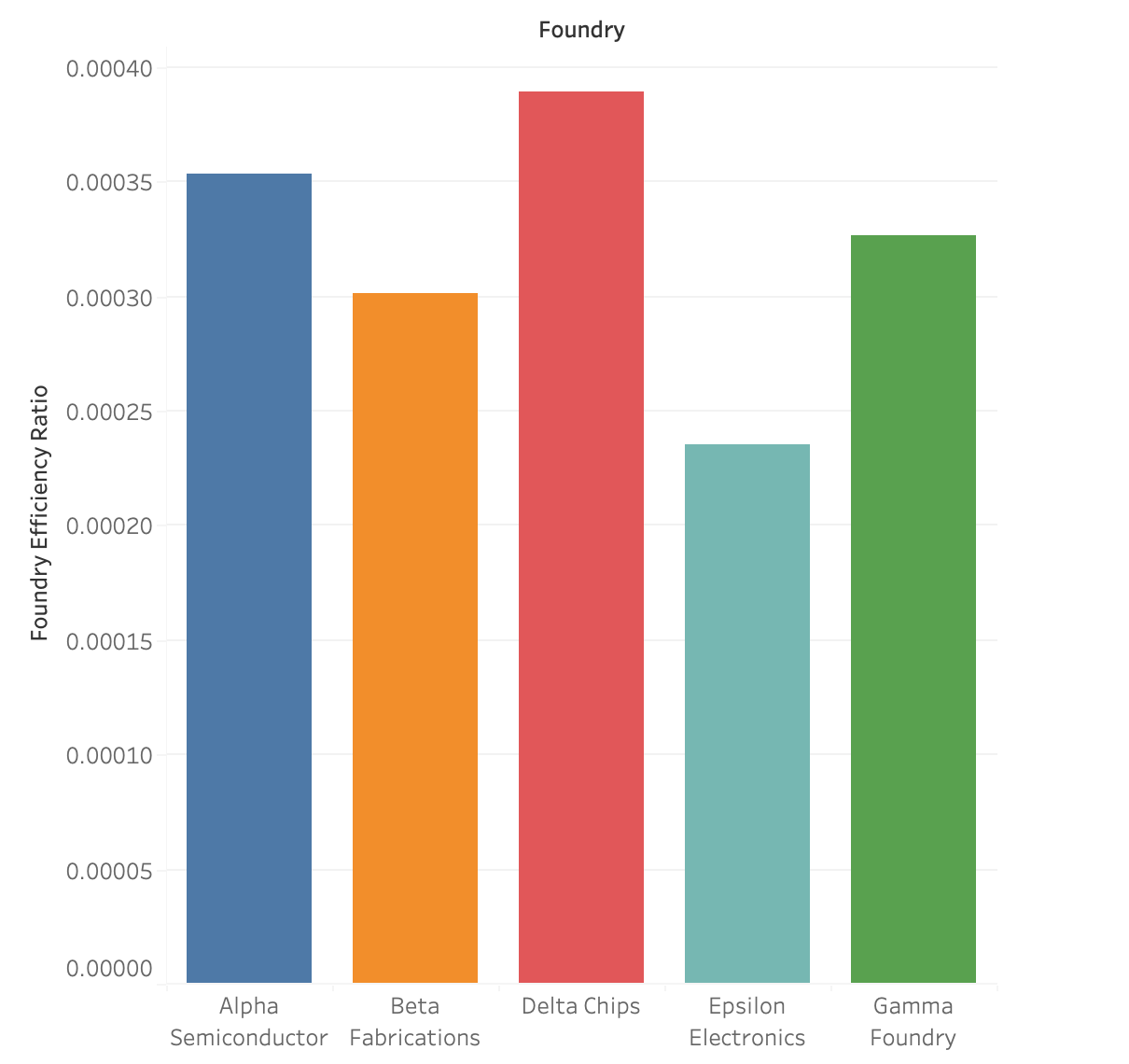
ORDER BY Foundry\_Efficiency\_Ratio DESC;

**Output**

A screenshot of a black screen

Description automatically generated

**Bar Chart Representation**



**Conclusion**

Based on the Foundry Efficiency Ratio, Delta Chips emerges as the best foundry among those listed. It balances production speed and cost management most effectively, resulting in the highest efficiency ratio.