Make vs. buy and Just in Time Production

Joe's Car Company can make its own engines for $1050 or buy them from the outside from a defunct Yugoslavian auto plant for $1000 per engine. Inventory holding cost is $800 per engine per year, and the cost of ordering, receiving etc. is $8000 per order. Joe needs 500 engines per year at a constant rate. Joe's EOQ for purchasing engines from the outside can be calculated as

$$Q_0 = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2*500*8000}{800}} = 100$$

With this order size, the total cost of ordering, storing and purchasing engines from the outside is:

$$TC = \frac{Q}{2} * H + \frac{D}{O} * S + P * D = \frac{100}{2} * \$800 + \frac{500}{100} * \$8000 + \$1000 * 500 = \$580,000$$

C) Suppose Joe's company makes the engines instead. By coincidence, The setup cost for each production run is the same as the cost of processing an order, $8000. Joe's engineers (thinking of their resumes) have designed a project for making engines on site at the rate of 2000 per year. Use rate would continue to be at 500 per year. What would the Economic Run size be?

D) Manufacturing engines will cost $1050/ engine. What is the total cost including holding & startup?

E) Oscar Optimizer just finished a course at UM-St.louis that changed his way of looking at the world, and suggests to Joe that he should fire the engineers and manufacture engines at a more conservative rate of 530 per year. What would the Economic Run Size be in this Case?

F) What is the total cost of manufacture, Inventory and startups for Oscar's scheme?

G) How does Oscar's "new way of looking at things" plan relate to Just-in-Time philosophy?

With P= 2000/ year

EOQ = 100; cost of purchase, IHC & OC = $580,000

$$ERS = \sqrt{\frac{2DS}{H}} * \sqrt{\frac{P}{P-U}} = 100 * \sqrt{\frac{2000}{2000-500}} = 115.5$$

$$I_{Max} = ERS * (\frac{P-U}{P}) = 115.5 * (\frac{2000-500}{2000}) = 86.625$$

$$TC = \frac{I_{max}}{2} * H + \frac{D}{Q} * S + P * D = \frac{86.625}{2} * \$800 + \frac{500}{115} * \$8000 + \$1050 * 500 = \$594,282$$

With P= 530/ year

$$ERS = \sqrt{\frac{2DS}{H}} * \sqrt{\frac{P}{P-U}} = 100 * \sqrt{\frac{530}{530-500}} = 420.32$$

$$I_{Max} = ERS * (\frac{P-U}{P}) = 420.32 * (\frac{530-500}{530}) = 23.79$$

$$TC = \frac{I_{max}}{2} * H + \frac{D}{Q} * S + P * D = \frac{23.79}{2} * \$800 + \frac{500}{420} * \$8000 + \$1050 * 500 = \$544,033$$

Just in Time Philosophy involves low inventory, make it as you need it. This is called the "pull" approach.

The engineers' scheme to build a large production capacity would not only result in excessive inventories and setup shutdown costs, but would also probably cost a lot more to build.
This is the "Push" Philosophy.

By producing at a slow rate *in situ* It was actually less expensive to manufacture in-house, even though the manufacturing cost was 5% higher than the price to purchase from the outside. Make versus buy decisions should consider all these factors and more.