BAB 6 KESIMPULAN DAN SARAN

6.1. Kesimpulan

Berdasarkan analisis dan pembahasan yang telah dilakukan, dapat diambil beberapa kesimpulan yaitu:

1. Dua model yang dikembangkan dengan menggunakan ukuran lot gabungan produsen dan pemasok sebagai ukuran lot pemesanan dapat digunakan untuk menentukan harga jual produk.
2. Pengembangan 2 model dengan ukuran lot gabungan tersebut menghasilkan harga jual produk per unit dan total biaya gabungan per periode yang lebih kecil daripada model Banerjee (1986).

6.2. Saran

Penelitian ini dilakukan dengan asumsi bahwa proses produksi mempunyai laju yang tetap. Saran untuk penelitian selanjutnya adalah dapat dilakukan penelitian lanjutan dengan mempertimbangkan:

1. Proses pemeriksaan produk dilakukan oleh pemasok dan memperhitungkan biaya garansi yang ditanggung pemasok jika terjadi kasus produk cacat sampai ke tangan produsen.
2. Dilakukan proses pemeriksaan produk pada produsen dengan menggunakan metode sampling.

Selain itu, penelitian lanjutan untuk mencari solusi model secara analitik perlu dilakukan.

DAFTAR PUSTAKA

Banerjee, A., 1986, *A supplier's pricing model under a customer's economic purchasing policy*, Omega, 14(5), 409-414.

Banerjee, A., 2005, *Concurrent pricing and lot sizing for make-to-order contract production*, International Journal of Production Economics, 94, 189-195.

Bintoro, A.G., 2019, Penentuan ukuran lot ekonomis gabungan produsen dan distributor untuk produk yang dijual dengan garansi, Jurnal Teknologi Industri, Vol XIII, No. 2, Hal. 165-179, Universitas Atma Jaya, Yogyakarta

Darwish, M., dan Ertogral, K., 2008, *The joint economic lot sizing problem: Review and extensions*, European Journal of Operational Research, 185, 726-742.

Hamid, S., dan Pasandideh, R., 2010, *An investigation of vendor-managed inventory application in supply chain: the EOQ model with shortage*, International Journal of Advanced Manufacturing Technology, 49, 329-339.

Kim, J., Hong, Y., dan Kim, T., 2011, *Pricing and ordering policies for price-dependent demand in a supply chain of a single retailer and a single manufacturer*, International Journal of Systems Science, 42(1), 81-89.

Kim, S.L., dan Ha, D., 2003, *A JIT lot-splitting model for supply chain management: Enhancing buyer-supplier linkage*, International Journal of Production Economics, 86(1), 1-10.

Lin, J.M.H.C., 2005, *A buyer-vendor EOQ model with changeable lead-time in supply chain*, International Journal of Production Economics, 26, 917-921.

Sana, S.S., dan Chaudhuri, K., 2005, *A Stochastic EOQ Policy of Cold-Drink-For a Retailer*, Vietnam Journal of Mathematics, 33(4), 437-442.

Santiyasa, I.W., 2011, Algoritma Newton Raphson Dengan Fungsi Non-Linear, Universitas Udayana, Bali.

Siagian, P., 1987, Penelitian Operasional: Teori dan Praktek, UI-Press, Jakarta.

Siswanto, 2007, *Operations Research*, Jilid Dua, Penerbit Erlangga, Jakarta.

Tersine, R.J., 1994, *Principles of Inventory and Materials Management*, Fourth Edition, Prentice Hall, New Jersey.

Wijanarko, W.S., 2012, Penentuan Ukuran Lot Ekonomis Gabungan antara Suplier dan Produsen di PT. Blambangan Foodpackers Indonesia, skripsi di Jurusan Teknik Industri Universitas Atma Jaya Yogyakarta, Yogyakarta.

Zimmer, K., 2002, *Supply chain coordination with uncertain just-in-time delivery*, International Journal of Production Economics, 77, 1-15.

LAMPIRAN

Lampiran 1 : Perhitungan model Banerjee (1986)

Diketahui :

D := 12000 S1 := 10
P := 48000 S2 := 500
h1 := 0.30 C2 := 4.5
h2 := 0.24 G := 1.5

Total Biaya Produsen Per Periode

$$TRC1 = D \cdot C1 + \frac{D}{Q} \cdot S1 + \frac{Q \cdot h1 \cdot C1}{2}$$

EOQ Produsen

$$Q = \sqrt{\frac{2 \cdot D \cdot S1}{C1 \cdot h1}}$$

Total Biaya Pemasok Per Periode

$$TRC2 = D \cdot C2 + \frac{D}{Q} \cdot S2 + \frac{D \cdot Q \cdot h2 \cdot C2}{2 \cdot P}$$

Jika :

$$a := \frac{S2}{\sqrt{\frac{2 \cdot D \cdot S1}{h1}}} = 0.559 \quad \text{dan} \quad b := \frac{h2 \cdot C2}{2 \cdot P} \cdot \sqrt{\frac{2 \cdot D \cdot S1}{h1}} = 0.01$$

Metode Newton-Raphson

Iterasi 0

$$C1 := C2 + G = 6$$

$$fC1 := C1 - C2 - a \cdot C1^{\frac{1}{2}} - b \cdot C1^{\frac{-1}{2}} - G = -1.373$$

$$ffC1 := 1 - \frac{1}{2} \cdot a \cdot C1^{\frac{-1}{2}} + \frac{1}{2} \cdot b \cdot C1^{\frac{-3}{2}} = 0.886$$

$$Gross0 := C1 - C2 - a \cdot C1^{\frac{1}{2}} - b \cdot C1^{\frac{-1}{2}} = 0.127$$

Iterasi 1

$$C11 := C1 - \frac{fC1}{ffC1} = 7.55$$

$$fC11 := C11 - C2 - a \cdot C11^{\frac{1}{2}} - b \cdot C11^{\frac{-1}{2}} - G = 0.01$$

$$ffC11 := 1 - \frac{1}{2} \cdot a \cdot C11^{\frac{-1}{2}} + \frac{1}{2} \cdot b \cdot C11^{\frac{-3}{2}} = 0.899$$

$$Gross1 := C11 - C2 - a \cdot C11^{\frac{1}{2}} - b \cdot C11^{\frac{-1}{2}} = 1.51$$

Iterasi 2

$$C111 := C11 - \frac{fC11}{ffC11} = 7.539$$

$$fC111 := C111 - C2 - a \cdot C111^{\frac{1}{2}} - b \cdot C111^{\frac{-1}{2}} - G = 4.197 \times 10^{-7}$$

$$ffC111 := 1 - \frac{1}{2} \cdot a \cdot C111^{\frac{-1}{2}} + \frac{1}{2} \cdot b \cdot C111^{\frac{-3}{2}} = 0.898$$

$$Gross2 := C111 - C2 - a \cdot C111^{\frac{1}{2}} - b \cdot C111^{\frac{-1}{2}} = 1.5$$

Iterasi 3

$$C1111 := C111 - \frac{fC111}{ffC111} = 7.539$$

$$fC1111 := C1111 - C2 - a \cdot C1111^{\frac{1}{2}} - b \cdot C1111^{\frac{-1}{2}} - G = 1.332 \times 10^{-15}$$

$$ffC1111 := 1 - \frac{1}{2} \cdot a \cdot C1111^{\frac{-1}{2}} + \frac{1}{2} \cdot b \cdot C1111^{\frac{-3}{2}} = 0.898$$

$$Gross3 := C1111 - C2 - a \cdot C1111^{\frac{1}{2}} - b \cdot C1111^{\frac{-1}{2}} = 1.5$$

Harga jual produk per unit = $7.539

Lampiran 2 : Perhitungan model 1

Diketahui :

$D := 12000$ $S1 := 10$
$P := 48000$ $S2 := 500$
$h1 := 0.30$ $C2 := 4.5$
$h2 := 0.24$ $G := 1.5$

Total Biaya Produsen Per Periode

$$TRC1 = D \cdot C1 + \frac{D}{Q} \cdot S1 + \frac{Q \cdot h1 \cdot C1}{2}$$

Total Biaya Pemasok Per Periode

$$TRC2 = D \cdot C2 + \frac{D}{Q} \cdot S2 + \frac{D \cdot Q \cdot h2 \cdot C2}{2 \cdot P}$$

Total Biaya Gabungan Per Periode

$$TRCGab = D \cdot C1 + \frac{D}{Q} \cdot S1 + \frac{Q \cdot h1 \cdot C1}{2} + D \cdot C2 + \frac{D}{Q} \cdot S2 + \frac{D \cdot Q \cdot h2 \cdot C2}{2 \cdot P}$$

Ukuran Lot Gabungan

$$QGab = \sqrt{\frac{[(D \cdot S1) + (D \cdot S2)] \cdot 2 \cdot P}{(C1 \cdot h1 \cdot P) + (C2 \cdot D \cdot h2)}}$$

Metode Newton-Raphson

Iterasi 0

$$C1 := C2 + G = 6$$

$$fC1 := C1 - C2 - \frac{S2}{\sqrt{\frac{[(D \cdot S1) + (D \cdot S2)] \cdot 2 \cdot P}{(C1 \cdot h1 \cdot P) + (C2 \cdot D \cdot h2)}}} - \frac{\sqrt{\frac{[(D \cdot S1) + (D \cdot S2)] \cdot 2 \cdot P}{(C1 \cdot h1 \cdot P) + (C2 \cdot D \cdot h2)}} \cdot h2 \cdot C2}{2 \cdot P} - G = -0.233$$

$$ffC1 := \frac{C2 \cdot P \cdot h1 \cdot h2 \cdot (2 \cdot D \cdot S1 + 2 \cdot D \cdot S2)}{4 \cdot (C2 \cdot D \cdot h2 + C1 \cdot P \cdot h1)^2 \cdot \sqrt{\frac{P \cdot (2 \cdot D \cdot S1 + 2 \cdot D \cdot S2)}{C2 \cdot D \cdot h2 + C1 \cdot P \cdot h1}}} - \frac{P^2 \cdot S2 \cdot h1 \cdot (2 \cdot D \cdot S1 + 2 \cdot D \cdot S2)}{2 \cdot (C2 \cdot D \cdot h2 + C1 \cdot P \cdot h1)^2 \cdot \left[\frac{P \cdot (2 \cdot D \cdot S1 + 2 \cdot D \cdot S2)}{C2 \cdot D \cdot h2 + C1 \cdot P \cdot h1}\right]^{\frac{3}{2}}} + 1 = 0.987$$

$$Gross0 := C1 - C2 - \frac{S2}{\sqrt{\frac{[(D \cdot S1) + (D \cdot S2)] \cdot 2 \cdot P}{(C1 \cdot h1 \cdot P) + (C2 \cdot D \cdot h2)}}} - \frac{\sqrt{\frac{[(D \cdot S1) + (D \cdot S2)] \cdot 2 \cdot P}{(C1 \cdot h1 \cdot P) + (C2 \cdot D \cdot h2)}} \cdot h2 \cdot C2}{2 \cdot P} = 1.267$$

Iterasi 1

$$C11 := C1 - \frac{fC1}{ffC1} = 6.236$$

$$fC11 := C11 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - G = 1.79\times 10^{-5}$$

$$ffC11 := \frac{C2\cdot P\cdot h1\cdot h2\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{4\cdot(C2\cdot D\cdot h2 + C11\cdot P\cdot h1)^2\cdot\sqrt{\frac{P\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C11\cdot P\cdot h1}}} - \frac{P^2\cdot S2\cdot h1\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C11\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C11\cdot P\cdot h1}\right]^{\frac{3}{2}}} + 1 = 0.987$$

$$Gross1 := C11 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} = 1.5$$

Iterasi 2

$$C111 := C11 - \frac{fC11}{ffC11} = 6.236$$

$$fC111 := C111 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - G = 1.035\times 10^{-13}$$

$$ffC111 := \frac{C2\cdot P\cdot h1\cdot h2\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{4\cdot(C2\cdot D\cdot h2 + C111\cdot P\cdot h1)^2\cdot\sqrt{\frac{P\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C111\cdot P\cdot h1}}} - \frac{P^2\cdot S2\cdot h1\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C111\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C111\cdot P\cdot h1}\right]^{\frac{3}{2}}} + 1 = 0.987$$

$$Gross2 := C111 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} = 1.5$$

Harga Jual Produk Per Unit = $6.236

Lampiran 3 : Perhitungan model 2

Diketahui :

D := 12000	S1 := 10	Cp := 20
P := 48000	S2 := 500	Ct := 50
h1 := 0.30	C2 := 4.5	
h2 := 0.24	G := 1.5	

Total Biaya Produsen Per Periode (Dengan Biaya Pemeriksaan)

$$TRC1 = D{\cdot}C1 + \frac{D}{Q}{\cdot}S1 + \frac{Q{\cdot}h1{\cdot}C1}{2} + \frac{D}{Q}{\cdot}Cp$$

Total Biaya Pemasok Per Periode (Dengan Biaya Pengiriman)

$$TRC2 = D{\cdot}C2 + \frac{D}{Q}{\cdot}S2 + \frac{D{\cdot}Q{\cdot}h2{\cdot}C2}{2{\cdot}P} + \frac{D}{Q}{\cdot}Ct$$

Total Biaya Gabungan Per Periode (Dengan Biaya Pemeriksaan + Biaya Pengiriman)

$$TRCGab = D{\cdot}C1 + \frac{D}{Q}{\cdot}S1 + \frac{Q{\cdot}h1{\cdot}C1}{2} + \frac{D}{Q}{\cdot}Cp + D{\cdot}C2 + \frac{D}{Q}{\cdot}S2 + \frac{D{\cdot}Q{\cdot}h2{\cdot}C2}{2{\cdot}P} + \frac{D}{Q}{\cdot}Ct$$

Ukuran Lot Gabungan

$$QGab = \sqrt{\frac{[(D{\cdot}S1) + (D{\cdot}S2) + (D{\cdot}Cp) + (D{\cdot}Ct)]{\cdot}2{\cdot}P}{(C1{\cdot}h1{\cdot}P) + (C2{\cdot}D{\cdot}h2)}}$$

Metode Newton-Raphson

Iterasi 0

$$C1 := C2 + G = 6$$

$$fC1 := C1 - C2 - \frac{S2}{\sqrt{\frac{[(D{\cdot}S1) + (D{\cdot}S2) + (D{\cdot}Cp) + (D{\cdot}Ct)]{\cdot}2{\cdot}P}{(C1{\cdot}h1{\cdot}P) + (C2{\cdot}D{\cdot}h2)}}} - \frac{\sqrt{\frac{[(D{\cdot}S1) + (D{\cdot}S2) + (D{\cdot}Cp) + (D{\cdot}Ct)]{\cdot}2{\cdot}P}{(C1{\cdot}h1{\cdot}P) + (C2{\cdot}D{\cdot}h2)}}{2{\cdot}P}{\cdot}h2{\cdot}C2 - \frac{Ct}{\sqrt{\frac{[(D{\cdot}S1) + (D{\cdot}S2) + (D{\cdot}Cp) + (D{\cdot}Ct)]{\cdot}2{\cdot}P}{(C1{\cdot}h1{\cdot}P) + (C2{\cdot}D{\cdot}h2)}}} - G = -0.241$$

$$ffC1 := \frac{C2{\cdot}P{\cdot}h1{\cdot}h2{\cdot}(2{\cdot}Cp{\cdot}D + 2{\cdot}Ct{\cdot}D + 2{\cdot}D{\cdot}S1 + 2{\cdot}D{\cdot}S2)}{4{\cdot}(C2{\cdot}D{\cdot}h2 + C1{\cdot}P{\cdot}h1)^2{\cdot}\sqrt{\frac{P{\cdot}(2{\cdot}Cp{\cdot}D + 2{\cdot}Ct{\cdot}D + 2{\cdot}D{\cdot}S1 + 2{\cdot}D{\cdot}S2)}{C2{\cdot}D{\cdot}h2 + C1{\cdot}P{\cdot}h1}}} - \frac{P^2{\cdot}S2{\cdot}h1{\cdot}(2{\cdot}Cp{\cdot}D + 2{\cdot}Ct{\cdot}D + 2{\cdot}D{\cdot}S1 + 2{\cdot}D{\cdot}S2)}{2{\cdot}(C2{\cdot}D{\cdot}h2 + C1{\cdot}P{\cdot}h1)^2{\cdot}\left[\frac{P{\cdot}(2{\cdot}Cp{\cdot}D + 2{\cdot}Ct{\cdot}D + 2{\cdot}D{\cdot}S1 + 2{\cdot}D{\cdot}S2)}{C2{\cdot}D{\cdot}h2 + C1{\cdot}P{\cdot}h1}\right]^{\frac{3}{2}}} - \frac{Ct{\cdot}P^2{\cdot}h1{\cdot}(2{\cdot}Cp{\cdot}D + 2{\cdot}Ct{\cdot}D + 2{\cdot}D{\cdot}S1 + 2{\cdot}D{\cdot}S2)}{2{\cdot}(C2{\cdot}D{\cdot}h2 + C1{\cdot}P{\cdot}h1)^2{\cdot}\left[\frac{P{\cdot}(2{\cdot}Cp{\cdot}D + 2{\cdot}Ct{\cdot}D + 2{\cdot}D{\cdot}S1 + 2{\cdot}D{\cdot}S2)}{C2{\cdot}D{\cdot}h2 + C1{\cdot}P{\cdot}h1}\right]^{\frac{3}{2}}} + 1 = 0.987$$

$$Gross0 := C1 - C2 - \frac{S2}{\sqrt{\frac{[(D{\cdot}S1) + (D{\cdot}S2) + (D{\cdot}Cp) + (D{\cdot}Ct)]{\cdot}2{\cdot}P}{(C1{\cdot}h1{\cdot}P) + (C2{\cdot}D{\cdot}h2)}}} - \frac{\sqrt{\frac{[(D{\cdot}S1) + (D{\cdot}S2) + (D{\cdot}Cp) + (D{\cdot}Ct)]{\cdot}2{\cdot}P}{(C1{\cdot}h1{\cdot}P) + (C2{\cdot}D{\cdot}h2)}}{2{\cdot}P}{\cdot}h2{\cdot}C2 - \frac{Ct}{\sqrt{\frac{[(D{\cdot}S1) + (D{\cdot}S2) + (D{\cdot}Cp) + (D{\cdot}Ct)]{\cdot}2{\cdot}P}{(C1{\cdot}h1{\cdot}P) + (C2{\cdot}D{\cdot}h2)}}} = 1.259$$

Iterasi 1

$$C11 := C1 - \frac{fC1}{ffC1} = 6.245$$

$$fC11 := C11 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - \frac{Ct}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - G = 1.937\times 10^{-5}$$

$$ffC11 := \frac{C2\cdot P\cdot h1\cdot h2\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{4\cdot(C2\cdot D\cdot h2 + C11\cdot P\cdot h1)^2\cdot\sqrt{\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C11\cdot P\cdot h1}}} - \frac{P^2\cdot S2\cdot h1\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C11\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C11\cdot P\cdot h1}\right]^{\frac{3}{2}}} - \frac{Ct\cdot P^2\cdot h1\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C11\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C11\cdot P\cdot h1}\right]^{\frac{3}{2}}} + 1 = 0.987$$

$$Gross1 := C11 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - \frac{Ct}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C11\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} = 1.5$$

Iterasi 2

$$C111 := C11 - \frac{fC11}{ffC11} = 6.244$$

$$fC111 := C111 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - \frac{Ct}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - G = 1.221\times 10^{-13}$$

$$ffC111 := \frac{C2\cdot P\cdot h1\cdot h2\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{4\cdot(C2\cdot D\cdot h2 + C111\cdot P\cdot h1)^2\cdot\sqrt{\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C111\cdot P\cdot h1}}} - \frac{P^2\cdot S2\cdot h1\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C111\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C111\cdot P\cdot h1}\right]^{\frac{3}{2}}} - \frac{Ct\cdot P^2\cdot h1\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C111\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C111\cdot P\cdot h1}\right]^{\frac{3}{2}}} + 1 = 0.987$$

$$Gross2 := C111 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - \frac{Ct}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} = 1.5$$

Iterasi 3

$$C1111 := C111 - \frac{fC111}{ffC111} = 6.244$$

$$fC1111 := C1111 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C1111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C1111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - \frac{Ct}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C1111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - G = 0$$

$$ffC1111 := \frac{C2\cdot P\cdot h1\cdot h2\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{4\cdot(C2\cdot D\cdot h2 + C1111\cdot P\cdot h1)^2\cdot\sqrt{\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C1111\cdot P\cdot h1}}} - \frac{P^2\cdot S2\cdot h1\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C1111\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C1111\cdot P\cdot h1}\right]^{\frac{3}{2}}} - \frac{Ct\cdot P^2\cdot h1\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{2\cdot(C2\cdot D\cdot h2 + C1111\cdot P\cdot h1)^2\cdot\left[\frac{P\cdot(2\cdot Cp\cdot D + 2\cdot Ct\cdot D + 2\cdot D\cdot S1 + 2\cdot D\cdot S2)}{C2\cdot D\cdot h2 + C1111\cdot P\cdot h1}\right]^{\frac{3}{2}}} + 1 = 0.987$$

$$Gross3 := C1111 - C2 - \frac{S2}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C1111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} - \frac{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C1111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}\cdot h2\cdot C2}{2\cdot P} - \frac{Ct}{\sqrt{\frac{[(D\cdot S1) + (D\cdot S2) + (D\cdot Cp) + (D\cdot Ct)]\cdot 2\cdot P}{(C1111\cdot h1\cdot P) + (C2\cdot D\cdot h2)}}} = 1.5$$

Harga Jual Produk Per Unit = $6.244

Lampiran 4 : Perhitungan ukuran lot optimal dan total biaya

Diketahui :

D := 12000	S1 := 10	Cp := 20	C111 := 6.244
P := 48000	S2 := 500	Ct := 50	
h1 := 0.30	C2 := 4.5	C1 := 7.539	
h2 := 0.24	G := 1.5	C11 := 6.236	

Banerjee 1986

Ukuran Lot

$$Q1 := \sqrt{\frac{2 \cdot D \cdot S1}{C1 \cdot h1}} \rightarrow 325.753$$

Total Biaya Produsen Per Periode

$$TRC1 := D \cdot C1 + \frac{D}{Q1} \cdot S1 + \frac{Q1 \cdot h1 \cdot C1}{2} \rightarrow 91204.755$$

Total Biaya Pemasok Per Periode

$$TRC2 := D \cdot C2 + \frac{D}{Q1} \cdot S2 + \frac{D \cdot Q1 \cdot h2 \cdot C2}{2 \cdot P} \rightarrow 72462.853$$

Total Biaya Gabungan Per Periode

$$TRCgab1 := TRC1 + TRC2 \rightarrow 163667.608$$

Model 1

Ukuran Lot

$$QGab1 := \sqrt{\frac{[(D \cdot S1) + (D \cdot S2)] \cdot 2 \cdot P}{(C11 \cdot h1 \cdot P) + (C2 \cdot h2 \cdot D)}} \rightarrow 2391.127$$

Total Biaya Produsen Per Periode

$$TRC11 := D \cdot C11 + \frac{D}{QGab1} \cdot S1 + \frac{QGab1 \cdot h1 \cdot C11}{2} \rightarrow 77118.846$$

Total Biaya Pemasok Per Periode

$$TRC21 := D \cdot C2 + \frac{D}{QGab1} \cdot S2 + \frac{D \cdot QGab1 \cdot h2 \cdot C2}{2 \cdot P} \rightarrow 56832.079$$

Total Biaya Gabungan Per Periode

$$TRCgab3 := TRC11 + TRC21 \rightarrow 133950.925$$

Model 2

Ukuran Lot

$$QGab2 := \sqrt{\frac{[(D \cdot S1) + (D \cdot S2) + (D \cdot Cp) + (D \cdot Ct)] \cdot 2 \cdot P}{(C111 \cdot h1 \cdot P) + (C2 \cdot D \cdot h2)}} \rightarrow 2548.521$$

Total Biaya Produsen Per Periode

$$TRC13 := D \cdot C111 + \frac{D}{QGab2} \cdot S1 + \frac{QGab2 \cdot h1 \cdot C111}{2} + \frac{D}{QGab2} \cdot Cp \rightarrow 77456.203$$

Total Biaya Pemasok Per Periode

$$TRC23 := D \cdot C2 + \frac{D}{QGab2} \cdot S2 + \frac{D \cdot QGab2 \cdot h2 \cdot C2}{2 \cdot P} + \frac{D}{QGab2} \cdot Ct \rightarrow 56933.787$$

Total Biaya Gabungan Per Periode

$$TRCgab4 := TRC13 + TRC23 \rightarrow 134389.991$$