EVE-ONLINE:
FINDING THE PERFECT MATERIAL LEVEL OF A BPO

VISCANNO

Perfect Material Level. *Given Ψ is waste factor when a BPO is material level 0, and ME_0 is the largest value from the materials required for production for one run of a BPO with material level 0, then for any BPO is the least whole number, p, such that*

$$p > 2.ME_0 \left(\frac{\Psi}{1+\Psi} \right) - 1$$

is the material level required such that there is no material wastage on the BPO.

Explanation

This question relates only to material waste and assumes the character using the blueprint original (BPO) has level 5 in the skill *Production Efficiency*.

Let Ψ denote the % waste when the BPO has material level 0 (Ψ is one of three values: 10%, 5% or 0%)[1].

Let ME_n denote the largest value from the materials required for production for one run of a BPO with material level n.

Let ω_n denote the waste for the largest value from the materials required for production for one run of a BPO with material level n.

Eve-Online truncates values around the half point, i.e., if $x < 0.5$ then $x = 0$, and if $0.5 \leq x \leq 1$ then $x = 1$.

Therefore, we want the waste at material level m to be less than $\frac{1}{2}$, hence reducing it to 0, i.e.:

$$\omega_m < \frac{1}{2} \tag{1}$$

It is known that by doubling the material level of a BPO you half the waste. The following represents this:

$$\omega_n = \frac{\omega_0}{n+1}$$

Hence, by substituting this in (1), we get:

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[1]see *Antimatter Charge L Blueprint*, *Armored Warfare Link – Damage Control Blueprint* and *Compressed Veldspar Blueprint* for respective examples.

$$\frac{\omega_0}{m+1} < \frac{1}{2}$$

Some simple rearranging gives:

$$m > 2\omega_0 - 1 \tag{2}$$

ω_0 represents waste when the BPO has material level 0. It is known that

$$\mathrm{ME}_0 = \mathrm{ME}_p + \omega_0$$

hence, by some simple rearranging:

$$\omega_0 = \mathrm{ME}_0 - \mathrm{ME}_p \tag{3}$$

Since we know that $\mathrm{ME}_0 = (1+\Psi)\,\mathrm{ME}_p$, then:

$$\mathrm{ME}_p = \frac{\mathrm{ME}_0}{(1+\Psi)} \tag{4}$$

Combining (3) and (4) we get:

$$\omega_0 = \mathrm{ME}_0 - \frac{\mathrm{ME}_0}{1+\Psi}$$

this becomes the following when simplified:

$$\omega_0 = \mathrm{ME}_0 \left(\frac{\Psi}{1+\Psi}\right) \tag{5}$$

Inserting (5) into (2) you have:

$$m \geq 2.\mathrm{ME}_0 \left(\frac{\Psi}{1+\Psi}\right) - 1$$

Since we seek the least m, then our perfect material level for any BPO is the least whole number, p, such that

$$p > 2.\mathrm{ME}_0 \left(\frac{\Psi}{1+\Psi}\right) - 1$$

Examples

Example: *Raven Blueprint.*

At material level 0, the blueprint demands the following materials:

Isogen	130,371
Megacyte	2,479
Mexallon	522,143
Noxium	32,555
Pyerite	2,084,282
Tritanium	8,335,395
Zydrine	7,766

and has 10% waste.

Therefore, for the *Raven Blueprint*: $\Psi = 10\%$ and $\mathrm{ME}_0 = 8,335,395$:

$$\begin{aligned} p &> 2 \times 8,335,395 \times \left(\tfrac{0.1}{1+0.1}\right) - 1 = 1515525.4 \\ p &= 1,515,526 \end{aligned}$$

Example: *Capacitor Control Circuit I Blueprint.*

At material level 0, the blueprint demands the following materials:

Burned Logic Circuit	83
Melted Capacitor Console	22
Tripped Power Circuit	72

and has 10% waste.

Therefore, for the *Large Capacitor Control Circuit I Blueprint*: $\Psi = 10\%$ and $\mathrm{ME}_0 = 83$:

$$\begin{aligned} p &> 2 \times 83 \times \left(\tfrac{0.1}{1+0.1}\right) - 1 = 15.1 \\ p &= 16 \end{aligned}$$