Example 9-2

In Example 9-1, find the voltage regulation of the transformer.

Example 9-1

A single-phase transformer has the following specifications:
20 kVA, 2400/240V, 60 Hz, full load at power factor of 0.8 lagging, $R_p = 0.8\ \Omega$, $X_p = 3\ \Omega$, $R_s = 0.008\ \Omega$, and $X_s = 0.03\ \Omega$.

(a) Find the equivalent circuit parameters referred to primary. Draw the equivalent circuit diagram and phasor diagram referred to primary.

(b) Find $\overrightarrow{V_p}$.

Equivalent circuit was referred to the primary side.

$$VR = \frac{V_p - aV_s}{aV_s} \times 100\ \%$$

$a\vec{V}_s = 2400\angle 0^\circ\ V \longrightarrow aV_s = 2400\ V$

$\vec{V}_p = 2440.86\angle 0.75^\circ \longrightarrow V_p = 2440.86\ V$

$$\therefore VR = \frac{2440.86 - 2400}{2400} \times 100\ \% = \boxed{1.70\ \%}$$