(2) 3.3-1. $T = \frac{3As^2}{v}$, $P = \frac{As^3}{v^2}$,

(a) Find $\mu$ as a function of $s, v$, then find the fundamental eq.

By Gibbs-Duhem Relation, $d\mu = v\,dp - s\,dT$

$$dp = d\left(\frac{As^3}{v^2}\right) \qquad dT = d\left(\frac{3As^2}{v}\right)$$

$$= \frac{3As^2}{v^2}ds - \frac{2As^3}{v^3}dv \qquad = \frac{6As}{v}ds - \frac{3As^2}{v^2}dv$$

$$\Rightarrow d\mu = v\,dp - s\,dT$$

$$= \frac{3As^2}{v}ds - \frac{2As^3}{v^2}dv - \frac{6As^2}{v}ds + \frac{3As^3}{v^2}dv.$$

$$= \frac{-3As^2}{v}ds + \frac{As^3}{v^2}dv.$$

integrating yields $\mu(s,v) = -\frac{As^3}{v} + -\frac{As^3}{v}$

$$= \boxed{-\frac{2As^3}{v} + c}$$

Then Euler Eq. states $U = TS - PV + \mu N$

$$= NTs - NPv + \mu N$$

$$= N\left[\frac{3As^3}{v} - \frac{As^3}{v}\right] - N\frac{2As^3}{v}$$

$\boxed{=0.}$ ?

(b) Find the fundamental equation of this system by direct integration.

$$du = T\,ds - P\,dv$$

$$\Rightarrow \boxed{u = \frac{2As^3}{v}}$$