$$\mathcal{H}^{[2]}(\rho;\ \theta_{A-1},\ \hat{\eta}_{A-1}) = T_K(\rho) + v_{A,A-1}\big(\underbrace{\sqrt{2}\,\rho\sin\theta_{A-1}}_{r_{A,A-1}}\cdot\underbrace{\hat{\eta}_{A-1}}_{\hat{r}_{A,A-1}}\big)$$

Diagonalize $\mathcal{H}^{[2]}$ on the A-body HH basis

$\Rightarrow$ eigen states $|j(\rho)\rangle$

Apply Lee-Suzuki similarity transformation to $\mathcal{H}^{[2]}$

$$\mathcal{H}^{[2]\text{eff}}(\rho;\theta_{A-1},\hat{\eta}_{A-1}) = U^{\dagger}(\rho)\,\mathcal{H}^{[2]}(\rho;\theta_{A-1},\hat{\eta}_{A-1})\,U(\rho)$$

$$\text{with } U(\rho) = (P+\omega(\rho))\,\frac{1}{\left(P[1+\omega(\rho)^{\dagger}\omega(\rho)]P\right)^{1/2}}$$

$$\omega(\rho) = Q\,\omega(\rho)\,P$$

calculate matrix $\omega(\rho)$ taking the $\underbrace{n_p}_{\dim\{P\}}$ states $|j(\rho)\rangle$ with the lowest eigen values using

$$\langle q|j(\rho)\rangle = \sum_p \langle q|\omega(\rho)|p\rangle\langle p|j(\rho)\rangle$$

$\Rightarrow$ Eff. potential $v^{[2]\text{eff}}_{A,A-1} = \mathcal{H}^{[2]\text{eff}} - T_K(\rho)$

is obtained $\Rightarrow$ take A-body Hamiltonian

$$H = T_{\rho} + T_K + \sum_{i<j} v^{[2]\text{eff}}$$

- $v^{[2]\text{eff}}$ depends upon ρ !

(ρ is more parameter than a coordinate)