KOMPRESSIV KEYK FILTRATSIYASIDA BOSIM – OQIM MUNOSABATLARI

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Suspenziya tashuvchi suyuqlik oqimining tezligi, u_l , oqava suyuqlik bosimi, p_e (atm), g'ovakli qatlamning chiqish tomonida, bosim, p_c (atm), suspenziya tomonidagi keyk yuzasi va bosim yordamida kek va shakllanishning garmonik o'rtacha o'tkazuvchanligi ifodalanishi mumkin..

Forchxaymer (1901) chiziqli holat uchun g'ovakli muhitlar orqali oqim qonuni quyidagicha ifodalanadi:

$$-\frac{\partial p}{\partial x}=\frac{\mu}{K}u+\rho\beta u^2 \quad (1)$$

Filtr keki va g'ovakli muhitdagi bosim farqlarini (1) tenglamani birlashtirish orqali ifodalash mumkin., mos ravishda (Civan, 1999c):

$$p_c-p_w=\left[\frac{\mu}{\overline{K}_c}\overline{u}_c+\rho_c\overline{\beta}_c\overline{u}_c^2\right](x_w-x_c) \quad (2)$$

$$p_w-p_e=\left[\frac{\mu}{\overline{K}_f}\overline{u}_f+\rho_f\overline{\beta}_f\overline{u}_f^2\right](x_e-x_w) \quad (3)$$

Kek matritsasi va g'ovak hosil bo'lish orqali oqib o'tadigan mayda zarrachalarning suspenziyalarining lahzali hajmli oqimlari va zichliklari bir xil deb hisoblanadi. Keyin (2) va (3) tenglamalarni qo'shing va qayta tartibga solish va hal qilish, Darsi oqimi uchun hosildorlik (Civan, 1999c) ($\beta_f=\beta_c=0$):

$$\overline{u}_c=\overline{u}_f\cong u_c=-\frac{\tilde{\gamma}}{\tilde{\beta}} \quad (4)$$

Va Darsi bo'lmagan oqim uchun:

$$\overline{u}_c=\overline{u}_f\cong u_c=\frac{(u_l)_{suspenziya}}{1-(\varepsilon_{pl})_{suspenziya}}=\frac{-\tilde{\beta}^2+\sqrt{\tilde{\beta}^2-4\tilde{\alpha}\tilde{\gamma}}}{2\tilde{\alpha}} \quad (5)$$

Qaysiki:

$$\tilde{\alpha}=\rho\left[\overline{\beta}_c(x_w-x_c)+\beta_f(x_e-x_w)\right] \quad (6)$$

$$\tilde{\beta}=\mu\left[\frac{x_w-x_c}{\overline{K}_c}+\frac{x_e-x_w}{\overline{K}_f}\right] \quad (7)$$

$$\tilde{\gamma}=-(p_c-p_e) \quad (8)$$

Oldingi yondashuv juda yaxshi aniqlik keltirgan bo'lsa-da, yanada qat'iy yondashuv quyidagilarni osonlashtirishi kerak:

$$u_c=\overline{u}_c-(x_w-x_c)\frac{d\overline{u}_c}{dx_c} \quad (9)$$

Radial oqim holati uchun Forchxeymer qonuni (1901) quyidagicha ifodalanadi:

$$-\frac{\partial p}{\partial r}=\frac{\mu}{K}u+\beta\rho u^2 \quad (10)$$

Volumetrik oqim va oqim tezligi quyidagilar bilan bog'liq:

$$u=\frac{q}{2\pi rh} \quad (11)$$

bu yerda h - qatlam qalinligi. Shunday qilib, (11) tenglamani (10) tenglamaga qo'ysak, quyidagi hosil qilinadi:

$$-\frac{\partial p}{\partial r}=\frac{\mu}{2\pi hK}\frac{q}{r}+\frac{\rho\beta}{(2\pi h)^2}\left(\frac{q}{r}\right)^2 \quad (12)$$

Filtr keki va g'ovakli muhitdagi bosim farqlarini (12) tenglamani birlashtirish orqali ifodalash mumkin., mos ravishda (Civan, 1999c

$$p_c-p_w=\frac{\mu\bar{q}_c}{2\pi h\bar{K}_c}\ln\left(\frac{r_w}{r_c}\right)+\frac{\rho\bar{\beta}_c\bar{q}^2}{(2\pi h)^2}\left(\frac{1}{r_c}-\frac{1}{r_w}\right) \quad (13)$$

$$p_w-p_e=\frac{\mu\bar{q}_f}{2\pi h\bar{K}_f}\ln\left(\frac{r_e}{r_w}\right)+\frac{\rho\bar{\beta}_f\bar{q}_f^2}{(2\pi h)^2}\left(\frac{1}{r_w}-\frac{1}{r_e}\right) \quad (14)$$

Kek matritsasi va g'ovakli muhit shakllanishi orqali oqib o'tadigan mayda zarrachalar suspenziyalarining zichligi va oniy oqim tezligi bir xil deb hisoblanadi. Keyin (13) va (14) tenglamalarni qo'shing va orqa masofani aniqlash va hal qilish, Darcy oqimi uchun hosildorlik (Civan, 1999c) ($\beta_f=\beta_c=0$):

$$\bar{q}_c=\bar{q}_f\cong q_c=-\frac{\tilde{\gamma}}{\tilde{\beta}} \quad (15)$$

Darsi bo'lmagan oqim uchun:

$$\bar{q}_c=\bar{q}_f\cong q_c=\frac{\rho}{2\pi r_c h}=\frac{(u_l)_{suspenziya}}{2\pi r_c h\left[1-(\varepsilon_{pl})_{suspenziya}\right]}=\frac{-\tilde{\beta}^2+\sqrt{\tilde{\beta}^2-4\tilde{\alpha}\tilde{\gamma}}}{2\tilde{\alpha}} \quad (16)$$

Qaysiki:

$$\tilde{\alpha}=\frac{\rho}{(2\pi h)^2}\left[\beta_c\left(\frac{1}{r_c}-\frac{1}{r_w}\right)+\beta_f\left(\frac{1}{r_w}-\frac{1}{r_e}\right)\right] \quad (17)$$

$$\tilde{\beta}=\frac{\mu}{2\pi h}\left[\frac{1}{\bar{K}_c}\ln\left(\frac{r_w}{r_c}\right)+\frac{1}{\bar{K}_f}\ln\left(\frac{r_e}{r_w}\right)\right] \quad (18)$$

$$\tilde{\gamma}=-(p_c-p_e) \quad (19)$$

Garchi bu yondashuv oqilona bahoga olib kelsa-da, yanada qat'iyroq yondashuvni qo'llash kerak:

$$q_c=\bar{q}_c-\left[\frac{r_w^2-r_c^2}{2r_c}\right]\frac{d\bar{q}_c}{dr_c} \quad (20)$$

Inertial oqim koeffitsienti Liu va boshqalar tomonidan (1995-yil) $\beta=2.92\times10^4\frac{\tau}{\varphi K}$ tenglama bilan berilgan korrelyatsiya orqali baholanadi

Xulosa. Kompressiv keyk filtratsiyasidagi bosim – oqim munosabatlarida suspenziya tomonidagi keyk yuzasi va bosim yordamida keyk shakllanishining garmonik o'rtacha o'tkazuvchanligi orqali ifodalanishiga olib keldi. Hamda keyk matritsasi va g'ovak hosil bo'lish orqali oqib o'tadigan mayda zarrachalar suspenziyalarining lahzali hajmli oqimlari va zichliklari bir xil deb hisoblanishini ko'rishimiz mumkin.

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