*Corresponding

Materials and Methods

Turbine transmission

Turbine speed:

$$N \quad 513.25 \ \frac{(Hg)^{0.745}}{\sqrt{Pm}}$$

$$N \quad 513.25 \ \frac{(25)^{0.745}}{\sqrt{79.5}} \quad 513.25 \quad 1.234$$

Turbine- generator speed ratio:

$$\text{Speed ratio} = \frac{\text{Generator speed}}{\text{Turbine speed}}$$

$$\frac{1500 \text{ RPM}}{635 \text{ RPM}} \quad 2.3622$$

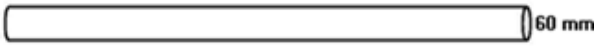

Figure 3: Turbine shaft diameter.

Figure 4: Turbine runner outer diameter.

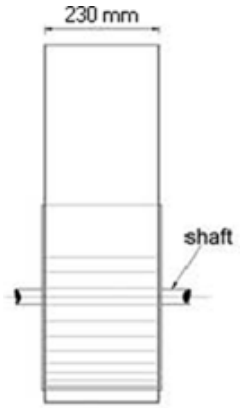

Figure 5: Turbine runner length.

Turbine runner tangential spacing and runner blade number:

$$Vj \quad \sqrt{2 \quad 9.81 \quad 25} \quad \sqrt{490.5} \quad 22.147 m/s$$

Turbine arc length:

$$rQ \quad \frac{Rc \quad Q^{o}}{180}$$

$$\frac{3.14 \quad 52 \quad 72^{0}}{1} \quad 65.132 \text{ mm}$$

$$V \quad \frac{Q}{A} \quad \frac{4 \quad Q}{d^2}$$

$$V \quad \frac{4 \quad 0.45}{(0.46)^2} \quad \frac{1.8}{0.664424} \quad 2.7091$$

Area of the penstock pipe:

$$A \quad \frac{(d)^2}{4}$$

$$A \quad \frac{(0.46)^2}{4} \quad 0.166$$

Penstock head loss:

$$\text{Head loss} = \frac{10 \quad n^2 \quad Q^2}{D_p^5} \quad Lp$$

$$\text{Head loss} = \frac{10 \quad (0.012)^2 \quad (0.45)^2}{(0.46)^5} \quad 162$$

Percentage of head loss:

$$\%\text{Head loss} = \frac{\text{Head loss}}{\text{Gross head}}$$

$$\%\text{Head loss} = \frac{2.29mm}{25\text{m}} \quad 0.0916$$

Pulley and belt design

Turbine design parameters:

(a)

Turbine pulley belt speed

$$\text{Velocity} = \frac{d}{2} \quad W$$

$$W \quad \frac{2 \quad N}{60}$$

$$\text{Velocity} = \frac{0.355}{2} \qquad \frac{633.80}{30} \quad 11.77 m/s$$

Belt centre distance

$$C \quad A \quad \sqrt{A^2 \quad B}$$

$$A \quad \frac{L}{4} \quad \frac{}{8}(d \quad D)$$

$$B \quad \frac{(D \quad d)^2}{8}$$

$$A \quad \frac{1825}{4} \quad \frac{}{8}(150 \quad 355) \quad 258.0375 mm$$

$$B \quad \frac{(355 \quad 155)^2}{8} \quad 5253.125 mm$$

$$C \quad 258.037 \quad \sqrt{(258.037)^2 \quad 5253.125} \quad 505.6869 mm$$

5. Mockmore CA, Merryfeld F (1949) The Banki water turbine. Engineering experimental station bulletin series No. 25.

6. http://www.entec.com.np/

7. Nasir BA (2014) Design considerations of micro hydro electric power plant. International Conference on Technologies and Materials for Renewable Energy, Environment and Sustainability, TMREES14[illegible]Energy Procec ! mpÖ Ēᴰ τɹʒ l v ʻC