In [1]:
```
import math
import tkinter as tk
from tkinter import messagebox

def calculate_diameter():
    try:
        P = float(entry_power.get())
        N = float(entry_speed.get())
        tau = float(entry_shear.get())

        T_mean = (P * 60) / (2 * math.pi * N)
        T_max = 1.25 * T_mean
        d = ((16 * T_max) / (math.pi * tau)) ** (1/3)
        d_mm = d * 1000  # Convert to mm

        result_window = tk.Toplevel(root)
        result_window.title("Calculation Result")
        result_window.geometry("350x200")
        result_window.config(bg="#e0f4f7")

        tk.Label(result_window, text="--- Results ---", font=("Helvetica", 14, "bol

        result_frame = tk.Frame(result_window, bg="#e0f4f7")
        result_frame.pack()

        tk.Label(result_frame, text=f"Mean Torque (T_mean): {T_mean:.2f} Nm", font=
        tk.Label(result_frame, text=f"Maximum Torque (T_max): {T_max:.2f} Nm", font
        tk.Label(result_frame, text=f"Required Shaft Diameter: {d_mm:.2f} mm", font

    except ValueError:
        messagebox.showerror("Input Error", "Please enter valid numerical values.")

root = tk.Tk()
root.title("Shaft Diameter Calculator")
root.geometry("400x300")
root.config(bg="#e0ecf4")

tk.Label(root, text="Shaft Diameter Calculator", font=("Helvetica", 16, "bold"), bg

input_frame = tk.Frame(root, bg="#e0ecf4")
input_frame.pack()

tk.Label(input_frame, text="Enter Power (kW):", font=("Helvetica", 11), bg="#e0ecf4
entry_power = tk.Entry(input_frame, font=("Helvetica", 11), width=20)
entry_power.grid(row=0, column=1, padx=10)

tk.Label(input_frame, text="Enter Speed (RPM):", font=("Helvetica", 11), bg="#e0ecf
entry_speed = tk.Entry(input_frame, font=("Helvetica", 11), width=20)
entry_speed.grid(row=1, column=1, padx=10)

tk.Label(input_frame, text="Enter Max Shear Stress (MPa):", font=("Helvetica", 11),
entry_shear = tk.Entry(input_frame, font=("Helvetica", 11), width=20)
entry_shear.grid(row=2, column=1, padx=10)

tk.Button(root, text="Calculate", font=("Helvetica", 12), bg="#ac4f50", fg="white",

root.mainloop()
```

In [ ]: