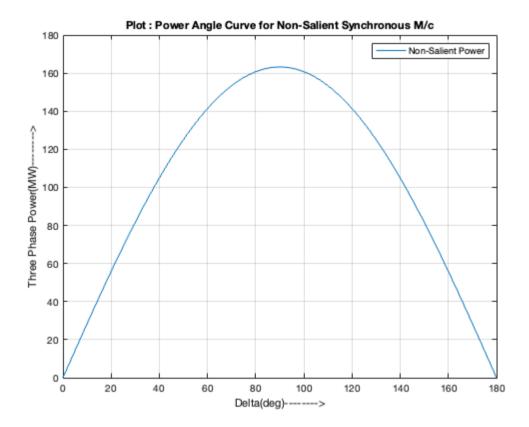```matlab
% Supreeth Rao 1MS19EE057 19/10/2022
% Determination of power angle characteristics of salient and non salient pole motor
clc;
clear;
P=48;
pf=0.8;
Vt=34.64;
Xd=10;
Xq=10;

Vtph=Vt*1000/sqrt(3); % Per phase Voltage
pf_a=acos(pf);
Q=P*tan(pf_a);
I=(P-j*Q)*1000000/(3*Vtph); % Current in Amps
delta=0:1:180;
delta_rad=delta*(pi/180);

if Xd~=Xq
    %Salient Pole Synchronous Motor
    Eq=Vtph+(j*I*Xq);
    Id_mag=abs(I)*sin(angle(Eq)-angle(I));
    Ef_mag=abs(Eq)+((Xd-Xq)*Id_mag);
    Exitation_emf=Ef_mag
    Reg=(Ef_mag-abs(Vtph))*100/abs(Vtph)
    PP=Ef_mag*Vtph*sin(delta_rad)/Xd;
    Reluct_Power=Vtph^2*(Xd-Xq)*sin(2*delta_rad)/(2*Xd*Xq);
    Net_Reluct_Power=3*Reluct_Power/1000000;
    Power_sal=PP+Reluct_Power;
    Net_Power_sal=3*Power_sal/1000000;
    plot(delta,Net_Reluct_Power,'K');
    hold on
    plot(delta,Net_Power_sal,'r');
    xlabel('Delta(deg)-------->');
    ylabel('Three Phase Power(pu)-------->');
    title('Plot : Power Angle Curve for Salient Synchronous M/c');
    legend('Reluct Power','Salient Power');
end

if Xd==Xq
    %Non-Salient Pole Synchronous Motor
    Ef=Vtph+(j*I*Xd);
    Exitation_emf=abs(Ef)
    Reg=(abs(Ef)-abs(Vtph))*100/abs(Vtph)
    Power_non=abs(Ef)*Vtph*sin(delta_rad)/Xd;
    Net_Power=3*Power_non/1000000;
    plot(delta,Net_Power);
    xlabel('Delta(deg)-------->');
    ylabel('Three Phase Power(MW)-------->');
    title('Plot : Power Angle Curve for Non-Salient Synchronous M/c');
    legend('Non-Salient Power');
    end

grid;
```

Exitation_emf =

   2.7203e+04


Reg =

36.0171

**Plot : Power Angle Curve for Non-Salient Synchronous M/c**



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