Experiment No. 08

8.1 Experiment Name

Simulation on hysteresis control of grid connected H-bridge system

8.2 Objectives

- To get familiarize with the Simulink platform and Simulink library
- To develop and study a H bridge inverter using Simulink
- To use the Simulink platform to construct and analyze a hysteresis control of H bridge inverter

8.3 Theory

Hysteresis control of grid connected H-bridge system

The purpose of the current controller is to control the load current by forcing it to follow a reference one. It is achieved by the switching action of the inverter to keep the current within the hysteresis band. The main advantages of this nonlinear control technique are related to its simple implementation, performing time response, and robustness.

8.4 Apparatus

- Simulink

8.5 Simulink Block Diagram & Waveform

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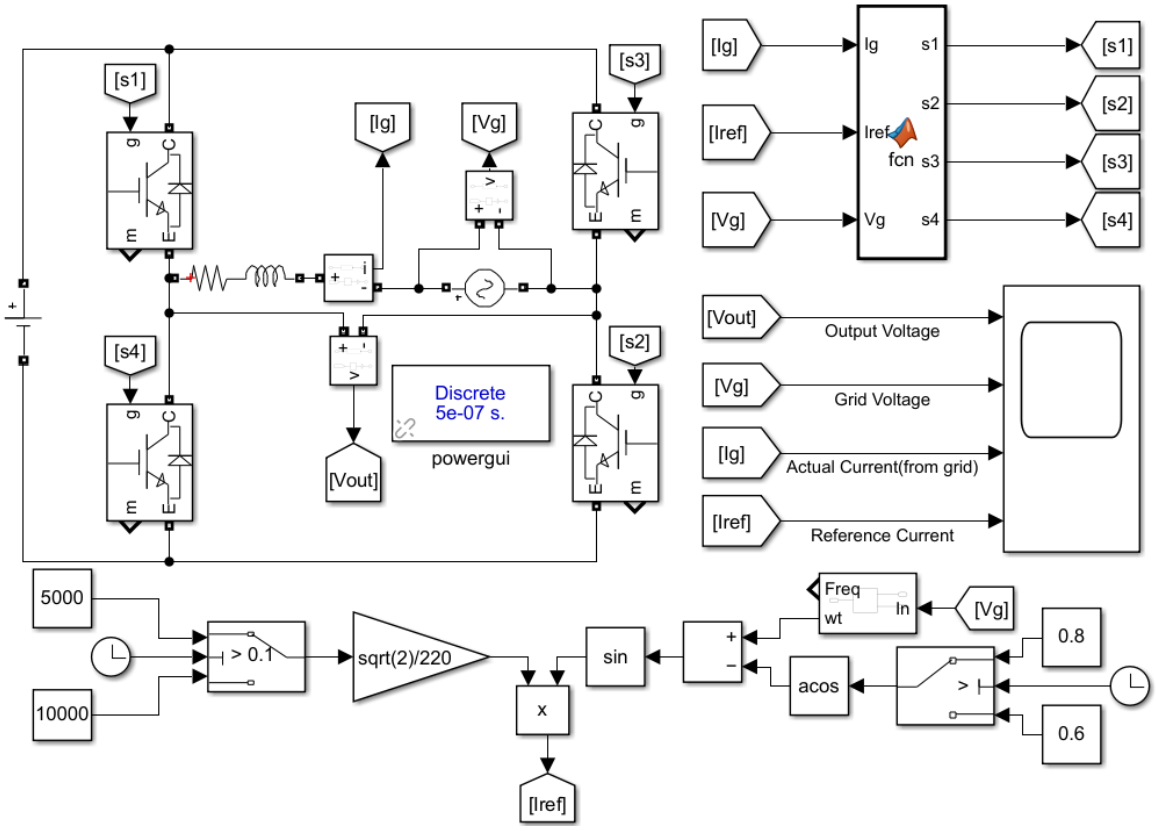

Fig.8.1: Block diagram of hysteresis control of grid connected H bridge system

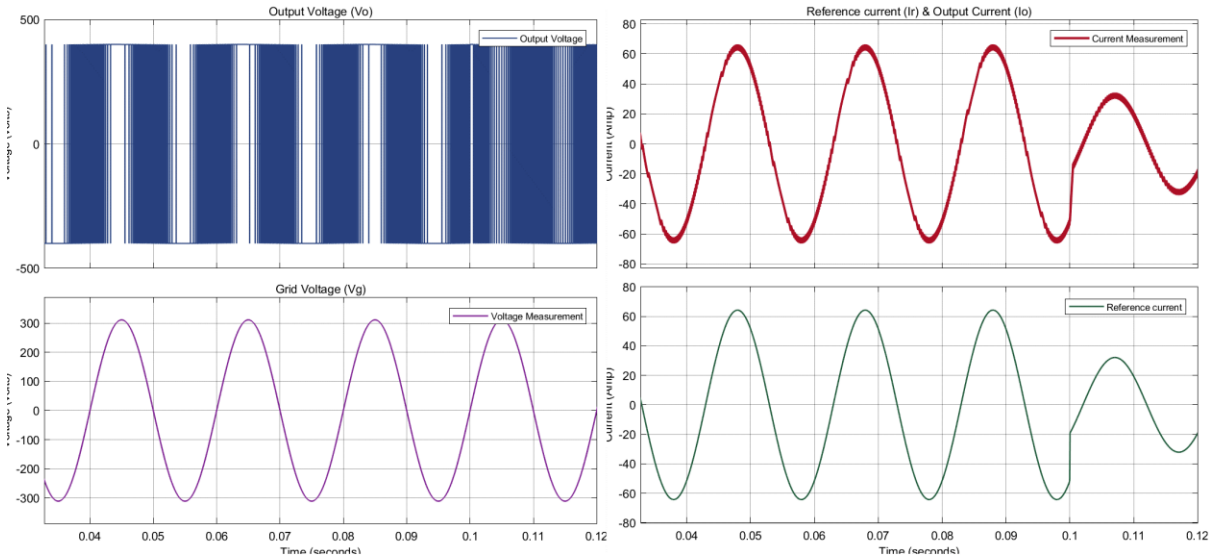

Fig.8.2: Waveform of bipolar hysteresis control of grid connected H bridge system

MATLAB Code

```
function [s1,s2,S3,S4] = fcn(Vg,Ig,Iref)
persistent Q1; if isempty(Q1)     Q1=0; end
persistent Q2; if isempty(Q2)     Q2=0; end
persistent Q3; if isempty(Q3)     Q3=0; end
persistent Q4; if isempty(Q4)     Q4=0; end
delta=1;
e=Ig-Iref;
if Vg>=0
    if e<=-delta
        Q1=1;   Q2=1;   Q3=0;   Q4=0;
    elseif e>=delta
        Q1=1;   Q2=0;   Q3=1;   Q4=0;
    else
        Q1=Q1;  Q2=Q2;  Q3=Q3;  Q4=Q4;
    end
else
    if e<=-delta
        Q1=1;   Q2=0;   Q3=1;   Q4=0;
    elseif e>=delta
        Q1=0;   Q2=0;   Q3=1;   Q4=1;
    else
        Q1=Q1;  Q2=Q2;  Q3=Q3;  Q4=Q4;
    end
   end
   s1=Q1;   s2=Q2;   S3=Q3;   S4=Q4;
end
```

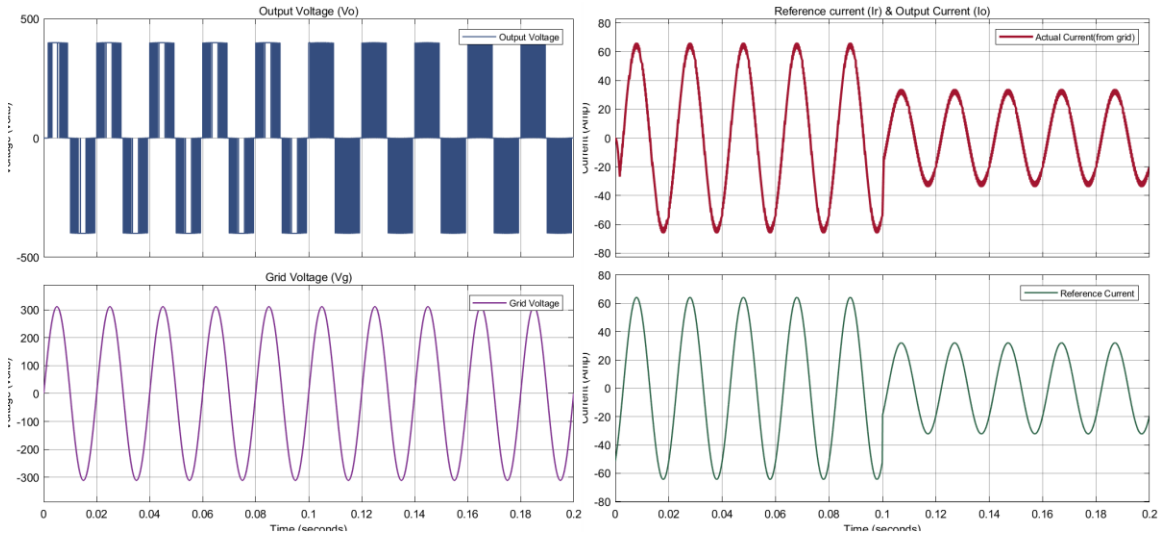

Fig.8.2: Waveform of unipolar hysteresis control of grid connected H bridge system

MATLAB Code

```
function [s1,s2,s3,s4] = fcn(Ig,Iref,Vg)
persistent Q1
if isempty(Q1);Q1=1;end
persistent Q2
if isempty(Q2);Q2=1;end
persistent Q3
if isempty(Q3);Q3=0;end
persistent Q4
if isempty(Q4);Q4=0;end
hd=2;
e=Ig-Iref;
if Vg>=0
    if e<=-hd
        Q1=1;Q2=1;Q3=0;Q4=0;
    elseif e>=hd
        Q1=1;Q2=0;Q3=1;Q4=0;
    else
        Q1 = Q1;Q2=Q2;Q3=Q3;Q4=Q4;
    end
else
    if e<=-hd
        Q1=0;Q2=1;Q3=0;Q4=1;
    elseif e>=hd
        Q1=0;Q2=0;Q3=1;Q4=1;
    else
        Q1 = Q1;Q2=Q2;Q3=Q3;Q4=Q4;
    end
end
s1=Q1; s2=Q2; s3=Q3; s4=Q4;
end
```

8.6 Discussion & Conclusion

This experiment thoroughly investigated hysteresis control of grid connected H bridge system. For this system, we utilized connection and value of parameter according to our preference. Similarly, for Hysteresis control inverter, we used necessary tool according to our requirements. Thus, desired output was observed and the simulation was a success.