

Team Name: PREW Generation

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Data Acquisition System for Synchronous Generator Transient Performance

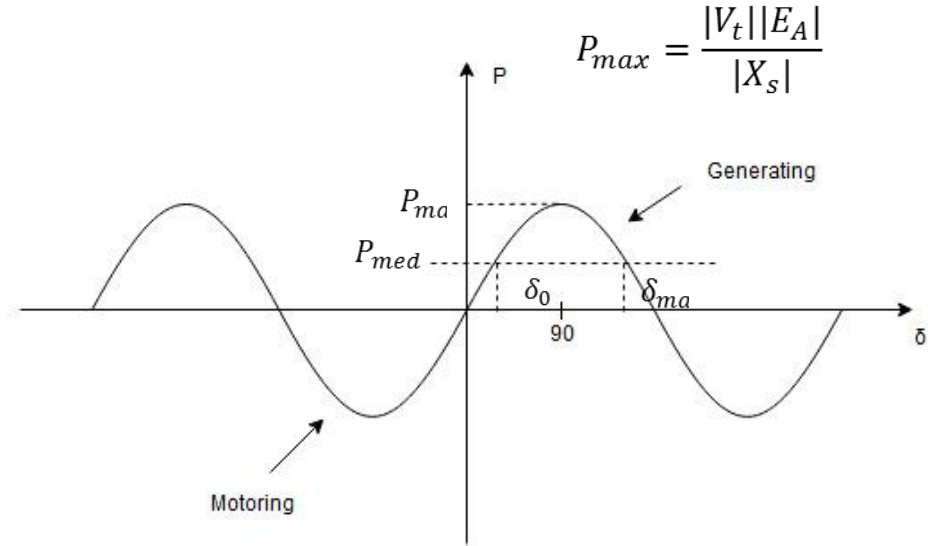
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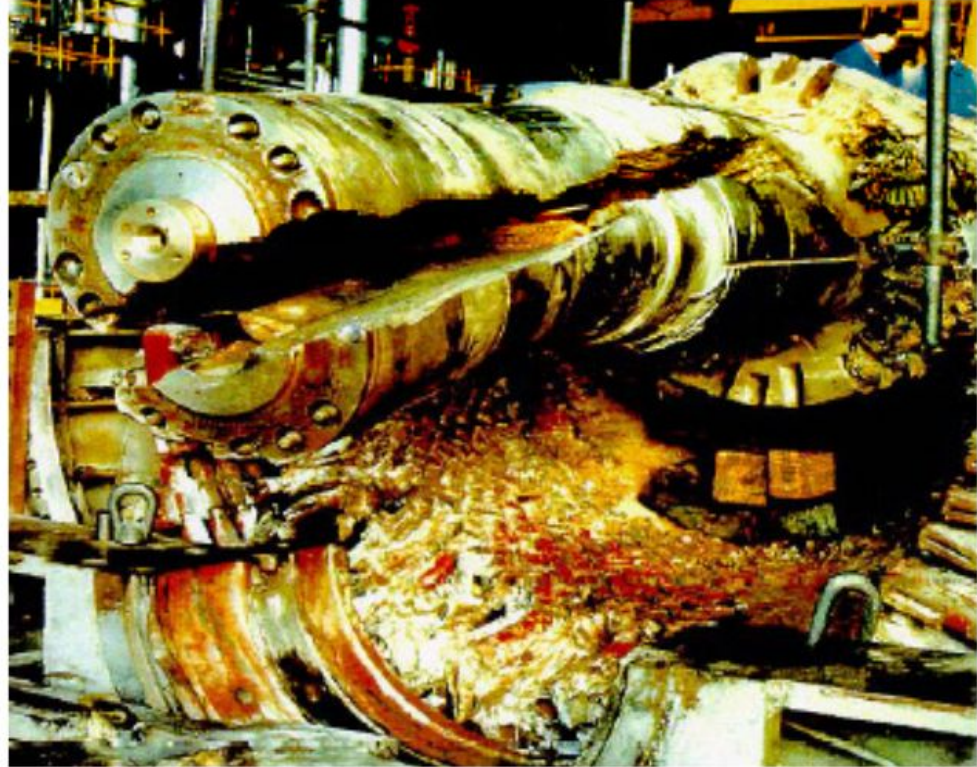
Problem Statement

During a fault in the system, the angle of the generator will increase and exceed δ_{max} . The generator may slip a pole.



Problems

- Severe electrical and mechanical damage to the generator, drive, and shaft.
- Severe stress on the network equipment and endangerment to its stability



Source: North West University (South Africa)

Goal of the Project

Design and implement a system to acquire measurements from 20 kVA synchronous generator in transient conditions

Measurement Requirements

- Terminal Voltage and Current
- Field Voltage and Current
- Torque and Power
- Speed and Frequency
- Load phase angle and shaft position

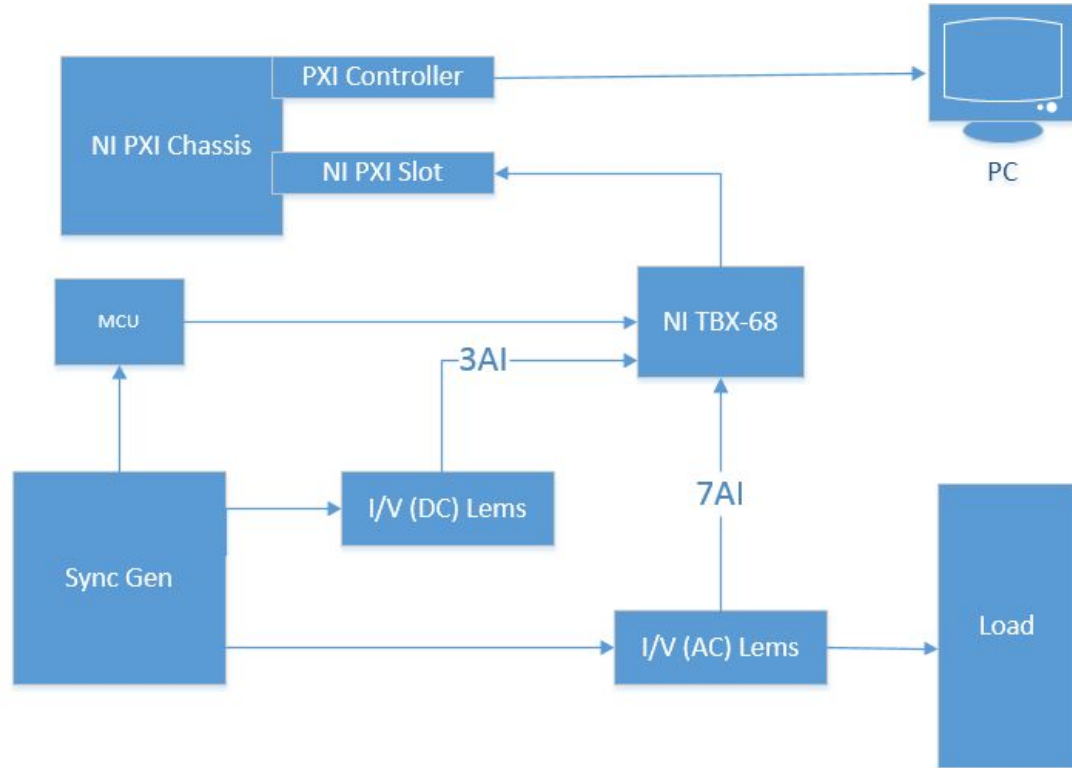
Data Acquisition Device Requirements

- Sampling rate of at least 10 kHz
- Measurements must be time synchronized
- Monitoring and storing streamed measurements

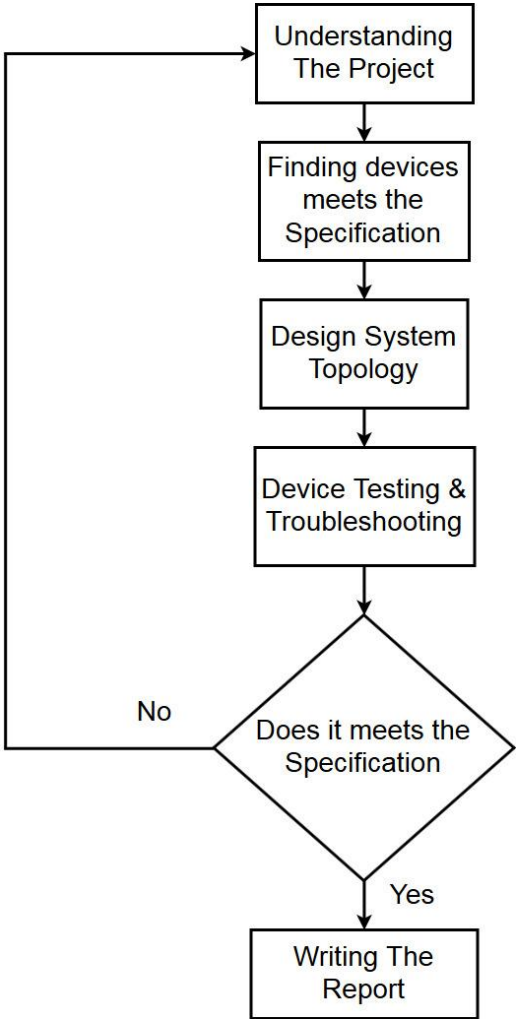
20kVA Synchronous Generator



System Topology



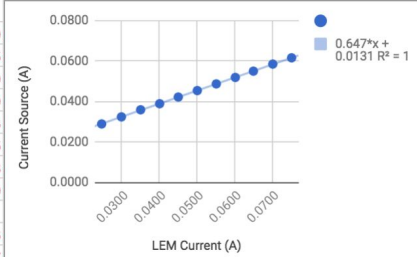
Plan of Completion



LEM I/O Ratio Testing

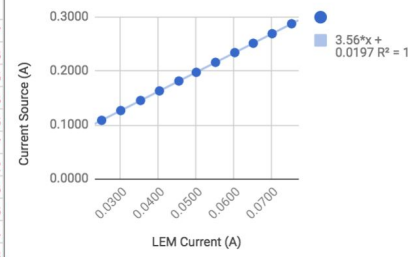
Board 1

Target DC	DC Source (V)	Current Source (A)	LEM Voltage (mV)	LEM Current (A)
5	4.94	0.0247	87	0.0290
6	5.99	0.0300	106	0.0325
7	7.01	0.0351	125	0.0360
8	8.02	0.0401	143	0.0390
9	9.01	0.0451	161	0.0423
10	10.02	0.0501	179	0.0455
11	11.03	0.0552	197	0.0488
12	12.04	0.0602	216	0.0520
13	13.00	0.0650	234	0.0551
14	14.03	0.0702	252	0.0586
15	15.03	0.0752	27	0.0617



Board 2 L1-L2

Target DC	DC Source (V)	Current Source (A)	LEM Voltage (mV)	LEM Current (A)
5	5.01	0.0251	99	0.1087
6	6.02	0.0301	118	0.1268
7	7.07	0.0354	136	0.1455
8	8.07	0.0404	155	0.1633
9	9.10	0.0455	173	0.1816
10	10.02	0.0501	190	0.1977
11	11.04	0.0552	208	0.2162
12	12.06	0.0603	227	0.2343
13	13.04	0.0652	244	0.2516
14	14.04	0.0702	263	0.2694
15	15.07	0.0754	281	0.2878



Board 2 L1-L3

Target DC	DC Source (V)	Current Source (A)	LEM Voltage (mV)	LEM Current (A)
5	5.08	0.0254	103	0.0142
6	6.09	0.0305	121	0.0174
7	7.07	0.0354	139	0.0204
8	8.00	0.0400	157	0.0235
9	9.05	0.0453	176	0.0269
10	10.00	0.0500	194	0.0300
11	10.99	0.0550	212	0.0332
12	12.01	0.0601	231	0.0364
13	13.03	0.0652	251	0.0398
14	14.03	0.0702	268	0.0429
15	15.01	0.0751	287	0.0461

