



Opportunities and Challenges for Energy Efficient Lighting in Canada

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CNC/CIE Workshop - Toronto

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Challenges

- low energy rates
- limited incentive programs
- scale of testing requirements
- perishable nature of LED products



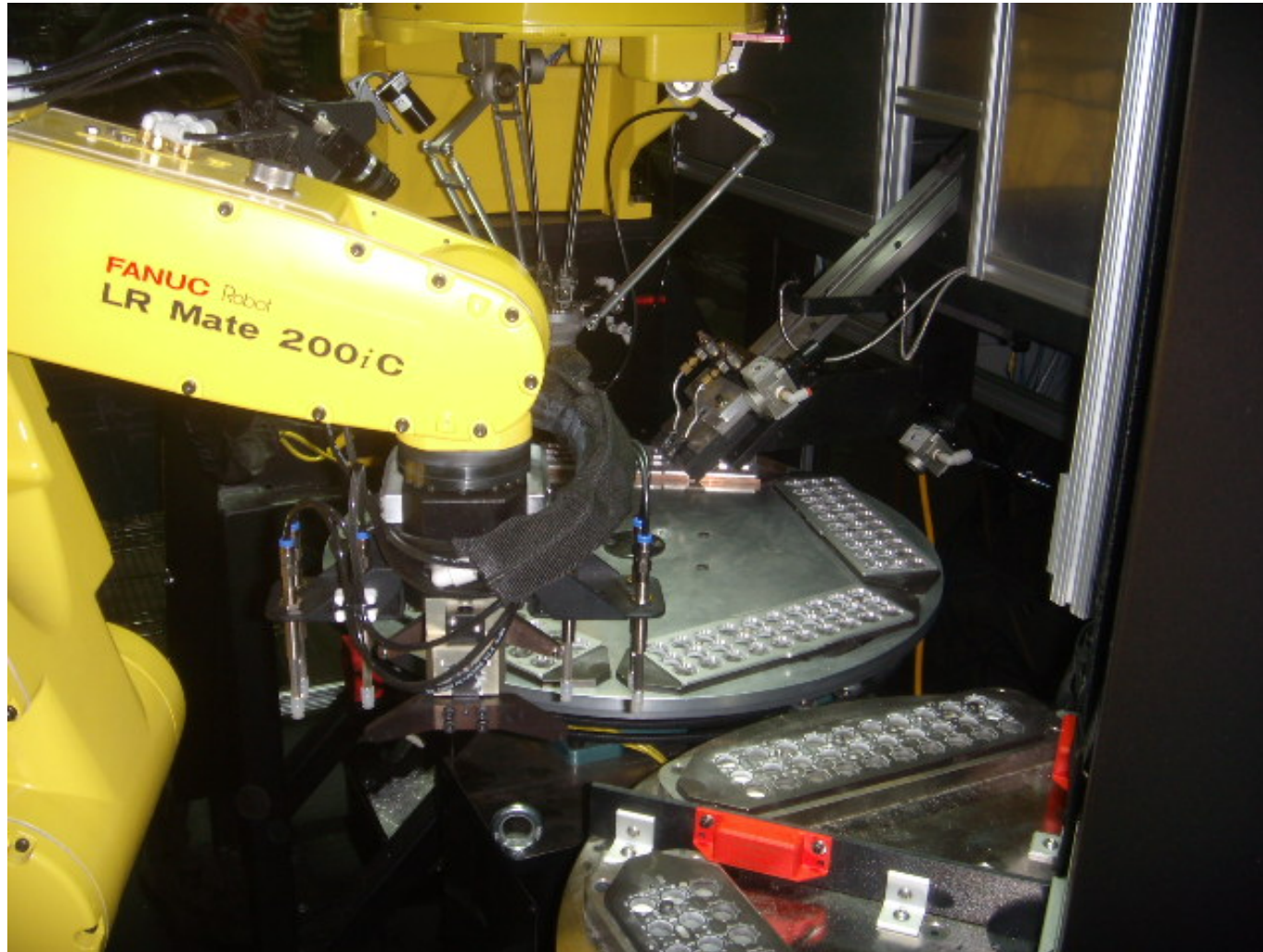
Opportunities

- invest in flexible manufacturing
- automation and proximity to market ; overcome low overseas labour rates
- invest in quality systems; manage manufacturing process risks
- market for LED is large and adoption is low



State of the Art Manufacturing & Quality Processes

Optical Carrier Assembly (Pick-and-Place Robots)



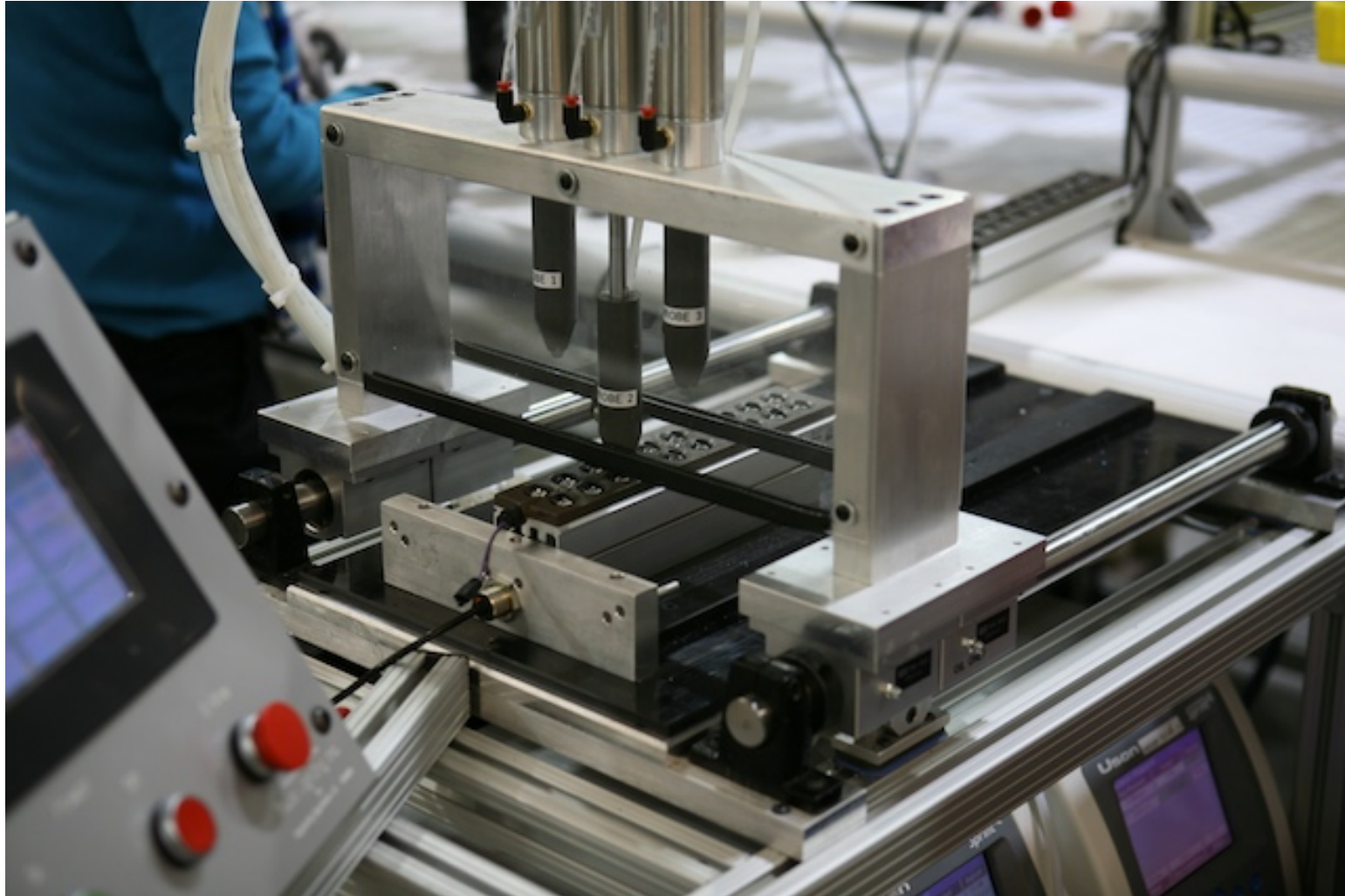
State of the Art Manufacturing and Quality Processes

Light Bar Assembly Process: Smart Screw Drivers

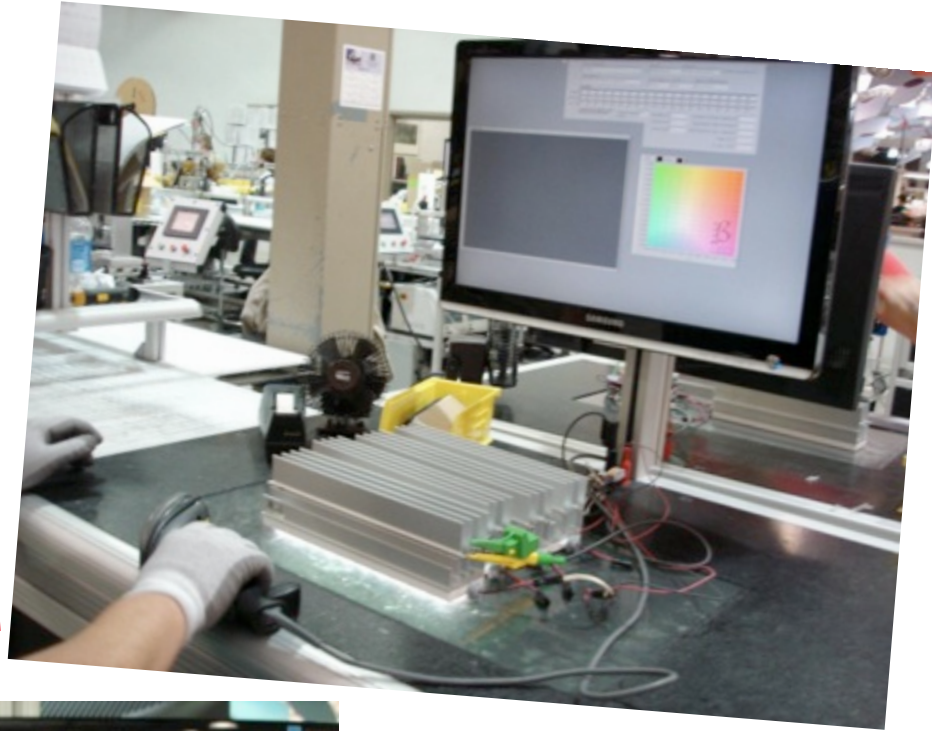


State of the Art Manufacturing and Quality Processes

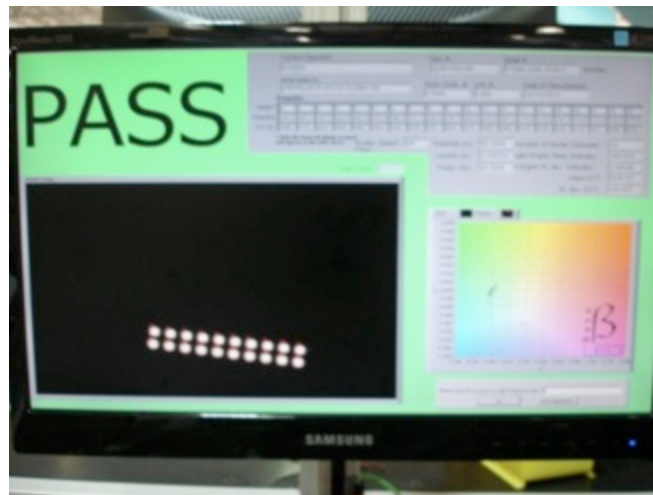
Vacuum Test



State of the Art Manufacturing and Quality Processes



Light Engine Testing



State of the Art Manufacturing and Quality Processes

13857 QGCN050IW0 6773.0004.031110 3/11/2010 11:28:16 AM PASS CHROMA,62012P-600-8,02.10,2008/04/15

I (mA)	V	W	Shutter Speed
0.35	96.614	33.783	900

Diode	X-Pixel Center	Y-Pixel Center	Mass	Intensity (bits)	X	Y	Z	x	y	u	v	u'	v'	CCT
0	439.975	354.74	204	87.606	0.335	0.364	0.352	0.319	0.346	0.196	0.319	0.196	0.478	6099.308
1	500.545	356.805	220	92.96	0.358	0.389	0.37	0.32	0.348	0.196	0.32	0.196	0.479	6020.215
2	561.667	358.735	219	91.673	0.356	0.388	0.362	0.322	0.351	0.196	0.321	0.196	0.481	5934.18
3	622.26	360.837	215	91.96	0.359	0.391	0.361	0.323	0.352	0.197	0.321	0.197	0.482	5875.25
4	683.286	363.154	234	95.258	0.369	0.402	0.377	0.321	0.35	0.196	0.32	0.196	0.48	5959.293
5	438.284	406.747	194	85.978	0.341	0.373	0.329	0.327	0.358	0.197	0.323	0.197	0.485	5723.665
6	498.663	408.635	208	91.356	0.354	0.386	0.36	0.322	0.351	0.196	0.321	0.196	0.481	5944.774
7	559.756	411.159	201	88.344	0.343	0.373	0.35	0.322	0.35	0.196	0.32	0.196	0.48	5940.208
8	620.383	412.916	227	96.209	0.374	0.407	0.379	0.322	0.351	0.196	0.321	0.196	0.481	5925.299
9	681.664	415.1	229	92.022	0.358	0.389	0.364	0.322	0.35	0.196	0.32	0.196	0.481	5926.336
10	435.688	485.47	202	86.559	0.333	0.363	0.345	0.32	0.348	0.196	0.32	0.196	0.479	6008.817
11	496.399	487.601	208	93.982	0.364	0.397	0.371	0.322	0.351	0.196	0.321	0.196	0.481	5941.029
12	557.397	489.658	199	88.671	0.348	0.38	0.345	0.324	0.354	0.196	0.322	0.196	0.483	5819.203
13	618.279	491.822	219	93.673	0.364	0.396	0.37	0.322	0.351	0.196	0.321	0.196	0.481	5926.57
14	679.164	493.987	238	99.553	0.387	0.422	0.391	0.322	0.352	0.196	0.321	0.196	0.481	5920.179
15	434.133	537.316	196	84.232	0.327	0.356	0.332	0.322	0.351	0.196	0.321	0.196	0.481	5931.168
16	494.828	539.703	209	92.455	0.355	0.388	0.367	0.32	0.349	0.196	0.32	0.196	0.48	6016.351
17	555.562	541.754	203	89.395	0.346	0.376	0.354	0.321	0.35	0.196	0.32	0.196	0.48	5958.591
18	616.4	543.983	230	99.57	0.387	0.423	0.391	0.322	0.352	0.196	0.321	0.196	0.482	5916.539
19	677.347	546.194	216	90.467	0.358	0.391	0.349	0.326	0.356	0.197	0.323	0.197	0.484	5752.249
20	431.747	616.159	182	83.832	0.323	0.352	0.333	0.321	0.349	0.196	0.32	0.196	0.48	6002.336
21	492.402	618.505	194	88.989	0.343	0.373	0.354	0.321	0.349	0.196	0.32	0.196	0.48	6004.104
22	553.281	620.304	217	91.678	0.355	0.388	0.361	0.322	0.351	0.196	0.321	0.196	0.481	5941.468
23	614.215	622.45	209	94.606	0.364	0.397	0.377	0.32	0.349	0.196	0.32	0.196	0.48	6017.982
24	675.088	624.447	228	93.494	0.363	0.396	0.368	0.322	0.351	0.196	0.321	0.196	0.481	5918.471
25	430.239	668.212	184	81.034	0.318	0.347	0.314	0.325	0.354	0.197	0.322	0.197	0.483	5800.786
26	490.612	670.539	206	90.377	0.351	0.382	0.355	0.322	0.351	0.196	0.321	0.196	0.481	5919.224
27	551.668	672.558	217	92.351	0.357	0.388	0.367	0.321	0.349	0.196	0.32	0.196	0.48	5984.208
28	612.705	674.35	220	94.428	0.366	0.399	0.373	0.322	0.351	0.196	0.32	0.196	0.481	5945.585
29	673.421	676.322	214	88.425	0.348	0.38	0.343	0.325	0.355	0.197	0.322	0.197	0.483	5790.426
Min				81.034									Min	5723.665
Max				99.57									Max	6099.308
Mean				91.0379									Mean	5928.794
St Dev				4.270959679									St Dev	83.15736

State of the Art Manufacturing and Quality Processes

Assembled Luminaire Testing



State of the Art Manufacturing and Quality Processes

Foam-In-Place



State of the Art Manufacturing and Quality Processes

DeltaGuard® Finishing: E- coat base



State of the Art Manufacturing and Quality Processes

DeltaGuard® Finish – 10 year warranty





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