



Bus Duct Monitoring in Factory

Linkou, Taiwan

AP Sensing was selected to provide a Linear Heat Detection (LHD) solution for Nanya Technology at its Linkou, Taiwan factory.

Nanya Technology produces DRAM and recently built a new memory production line at its Linkou factory, with 32 new bus ducts added to the production lines. The operator previously used a daily thermography service to manually inspect the temperature of the bus ducts for safety. However, due to their complex installation layout, this alone did not enable Nanya Technology to sufficiently monitor the temperature of each joint between the bus ducts. Joints are the most critical part of a bus duct and cause overheating and fires when loose or faulty. Now, AP Sensing's Distributed Temperature Sensing (DTS) technology continuously monitors the entire length of the bus ducts.

The 32 bus ducts include more than 500 joints and are covered by a 2km and 2 channel DTS LHD device, with the use of 3000m fiber optical safety cable as the temperature sensor. The voltage of the bus ducts are 480V and 208V, with a maximum current of 2500A.



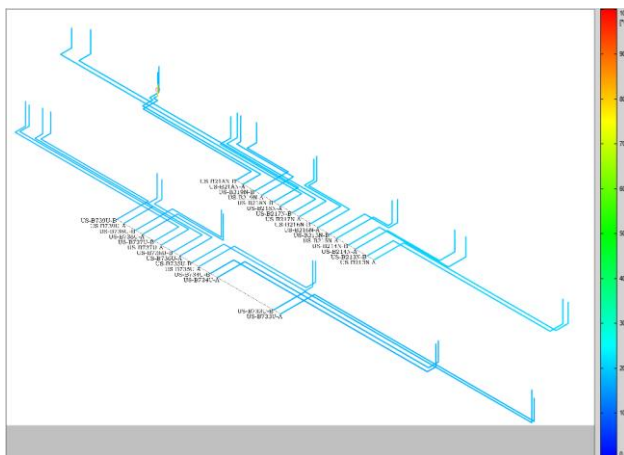
Fiber optic sensor cable installed on the bus duct

From the single fiber optic sensor cable, each bus duct zone was assigned an independent alarm zone and the alarm parameters include different alarms for: reaching a maximum temperature, varying from the zone average, and temperature gradient or rapid temperature changes. The maximum temperature of each zone is transferred automatically to SCADA from the DTS by Industry Standard Modbus Protocol.

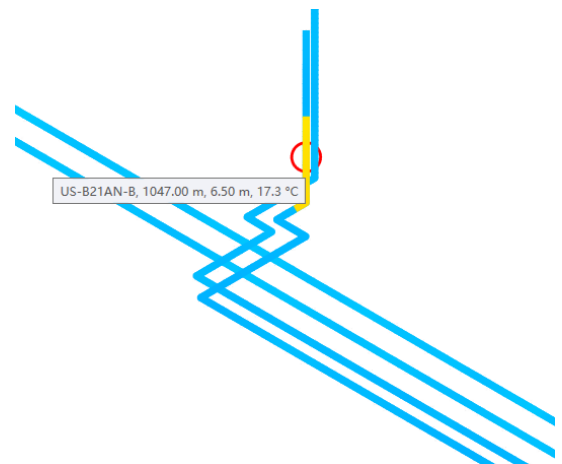
SmartVision software is utilized for visualization and management of the bus ducts.

It offers the following features:

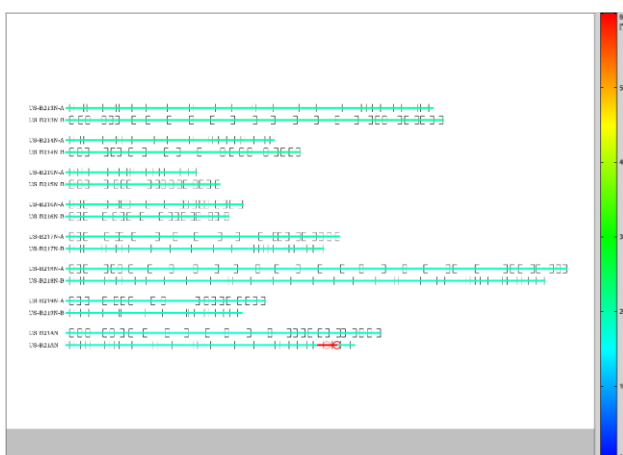
- Bus duct state visualization at a glance
- Real-time bus duct temperature distribution view
- Display of maximum and average temperatures as well as bus duct load
- Comprehensive, intelligent alarm management and communication
- Historical data analysis for predictive maintenance.



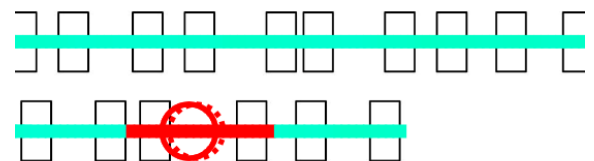
Bus duct layout overview



Alarm on visualization



Bus duct zone overview



Alarm on visualization

AP Sensing's LHD system advantages:

- Passive temperature sensor cable for temperature measurement along entire bus duct
- Temperature range from -40°C to +150 °C (peak) for bus duct fault monitoring
- Immunity to EMI, constructed from insulating materials
- Spatial resolution down to 0.5m that ensures at least one temperature measurement point for each joint
- All alarms and maximum temperatures of each bus duct are automatically transferred to SCADA via Modbus Protocol
- All temperature and bus duct load data is stored in a database where the operator can review changes over time to predict potential risk and schedule maintenance without interrupting DRAM production.

DTS名稱	曲線時間	名稱	開始[m]	停止[m]	平均值[°C]	最大值[°C]	最小值[°C]	G1[°C/s]	G2[°C/s]	G3[°C/s]
N4415A (DE47502061)	2017/2/15 13:24:52	US-B735U-A	85.75	145.00	17.88	18.50		0.63/120	0.83/240	0.60/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B735U-B	145.00	213.50	17.59	18.28		0.84/120	0.94/240	1.00/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B736U-A	216.00	267.00	17.64	18.27		0.96/120	0.70/240	0.60/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B736U-B	267.00	317.50	17.56	17.94		0.55/120	0.44/240	0.55/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B737U-A	320.00	417.50	17.66	18.24		0.72/120	0.83/240	0.87/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B737U-B	417.50	512.50	17.50	18.16		0.90/120	1.02/240	0.84/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B738U-A	515.00	561.00	17.19	17.93		0.65/120	0.98/240	0.51/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B738U-B	561.00	608.50	17.62	18.18		1.10/120	0.86/240	0.73/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B739U-A	610.50	688.50	17.30	18.37		0.95/120	1.05/240	0.74/360
N4415A (DE47502061)	2017/2/15 13:24:52	US-B739U-B	688.50	761.00	17.44	18.32		0.68/120	1.06/240	0.82/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B213N-A	17.75	110.00	20.40	21.17		1.13/120	0.81/240	0.74/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B213N-B	110.00	204.50	20.25	21.36		0.68/120	0.87/240	0.66/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B214N-A	206.50	259.00	20.10	20.53		0.48/120	0.78/240	0.59/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B214N-B	260.50	319.50	19.69	20.64		0.76/120	0.82/240	0.82/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B215N-A	321.50	355.00	19.87	20.41		0.52/120	0.71/240	0.63/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B215N-B	355.00	393.50	19.46	20.15		0.61/120	0.72/240	1.05/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B216N-A	395.00	440.50	19.60	21.24		1.23/120	1.14/240	1.13/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B216N-B	440.50	481.00	19.23	19.89		0.77/120	0.89/240	1.00/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B217N-A	483.00	551.50	19.27	20.08		0.90/120	0.95/240	0.88/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B217N-B	551.50	615.50	18.93	19.55		0.53/120	0.80/240	0.68/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B218N-A	617.50	743.00	18.81	19.59		0.68/120	0.96/240	0.77/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B218N-B	743.00	862.50	18.44	19.33		0.67/120	0.95/240	1.39/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B219N-A	865.00	915.50	18.28	18.97		0.80/120	0.96/240	1.07/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B219N-B	915.50	960.00	18.18	18.72		0.56/120	0.73/240	0.65/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B219N-A	961.50	1040.50	18.13	19.05		1.20/120	1.28/240	1.34/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B219N-B	1040.50	1112.50	17.87	18.54		0.65/120	0.70/240	0.87/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B733U-A	1114.00	1232.50	17.54	18.49		0.76/120	0.96/240	1.01/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B733U-B	1232.50	1357.00	17.19	18.21		0.79/120	0.85/240	1.13/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B734U-A	1377.00	1481.00	17.10	18.09		0.98/120	1.09/240	1.36/360
N4415A (DE47502061)	2017/2/15 13:24:22	US-B734U-B	1481.00	1597.00	16.59	17.58		0.50/120	0.88/240	1.07/360

Alarm zone state

This DTS system has been continuously monitoring the bus ducts and functioning smoothly since installation. Plans are in place for similar projects in the future.