CASE STUDY

Double Tecan® Cold Decks controlled with Julabo *FP50-MW*

Prepared by staff engineers at Julabo USA, Inc.

The Objective:

Achieving & maintaining a constant temperature in two Aluminum "Cold Decks" (or Thermal Blocks) for Micro Plate applications dominant in the Life Sciences.

Tecan's miniature assay for High Throughput Screening (HTS) applications

The Motivation:

The temperatures +4°C and +37°C are common requirements in biotechnology applications given that the former is a usable point above freezing H_2O, while the latter body temperature. In the effort to increase the throughput of assays, more Micro Plates are necessary giving rise to larger "Cold Decks" in order to accommodate them. In this case, "Cold Decks" with larger surface areas are needed, and at the same time demands superior temperature control and higher cooling capacities due to greater heat losses involved.

The Solution:

Using Julabo Heating & Refrigerated Circulator *FP50-MW* (# 9235650) as a cost-effective solution for temperature control, and Julabo *EZTemp*™ software (*free*) for Data Acquisition of both the internal (*FP50-MW*) & external (Cold Deck) temperatures.

Julabo FP50-MW Heating & Refrigerated Circulator

Test Goal:

Tecan USA, Inc. requires a liquid temperature control instrument for maintaining two Tecan Cold Decks at the following temperatures:

a) T_{ext} =+ 4°C,
b) T_{ext} =+37°C,

measured in the plastic vials containing Ethylene Glycol-Water (50-50%) mixture. Cold Deck "A" sat eleven Aluminum Blocks, while Cold Deck "B" held ten Aluminum Blocks.

Test Summary:

Tests conducted at Julabo USA, Inc. with an FP50-MW Refrigerated & Heating Circulator showed the ability to meet the above requirements within a reasonable time frame (< 2 Hrs. from +20°C initial temperature). Internal bath temperatures of –3.0°C and +44.5°C were necessary to obtain T_{ext} of +4°C and +37°C, respectively. A maximum deviation of ±1.5°C was observed for T_{ext} across the two Cold Decks. About 9 liters of Ethylene Glycol-Water (50-50%) mixture were utilized as the circulating medium or bath fluid. Additionally, 10mm ID Viton® tubing & Foam Insulation were used to transport & insulate the circulating medium.

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Figure 1 illustrates the measuring points of T_{ext} at five Vial locations (at four corners and in the middle). A separate RTD temperature sensor was used to record these five temperature points over time. This sensor was immersed in ~1" of Glycol-Water mix contacting the Vials' internal surface. The attached plots, Figures 2 and 3, show the test results for the two desired temperatures using an FP50-MW and a pair of Quad-Flow Manifolds.

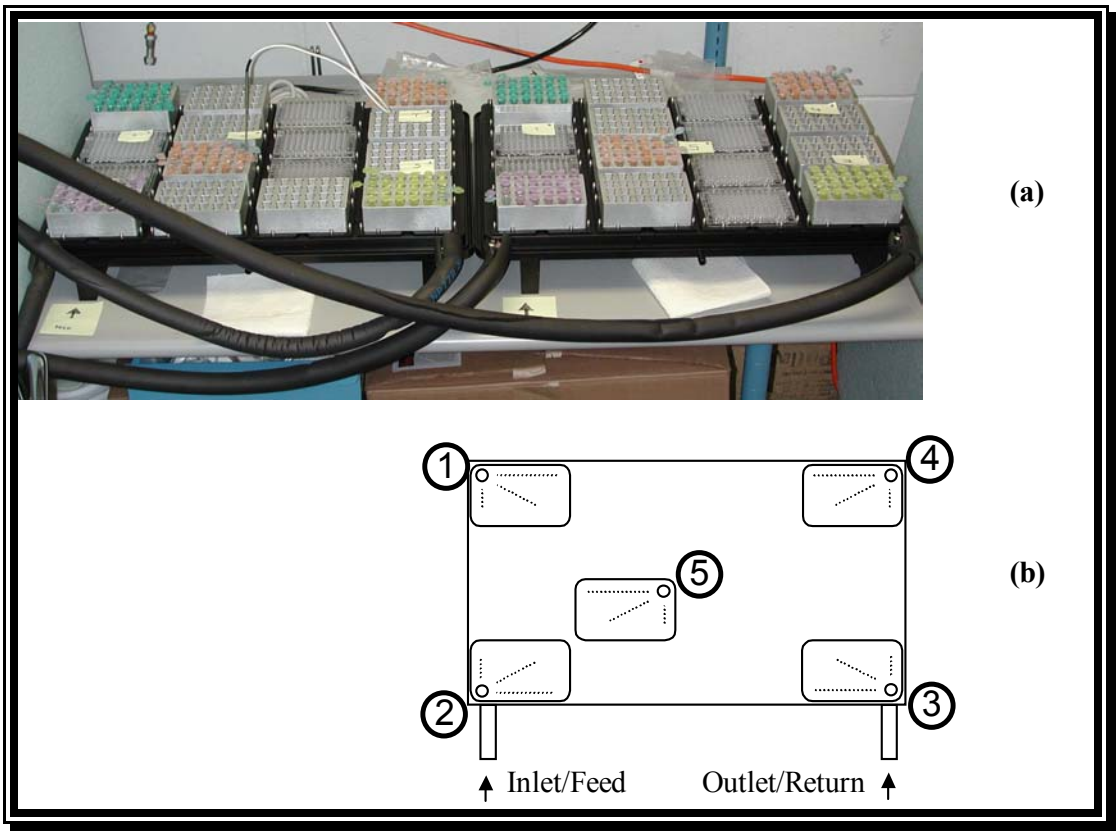

Figure 1: (a) Image of 2 Cold Deck Set-up; (b) Diagram of sensor positions "1" through "5" representing the Vials at four furthest corners and nearest middle.

Test Results & Conclusion:
In this test, the FP50-MW was set to "Internal Control", which results in a slower temperature response for T_{ext}. Moreover, the internal bath setpoints of –3°C and +44°C were obtained through trial and error. Therefore, Julabo recommends a High Tech Circulator (i.e. FP50-HE or F P50-HP) with external PT100 capability, which enables "External Control" of the process. The advantages of "External Control" are as follows:

1) Faster External Temperature Response.

2) Improved External Temperature Stability over Time

The additional accessory required for this function is a Pt100 external temperature sensor (#8981006).

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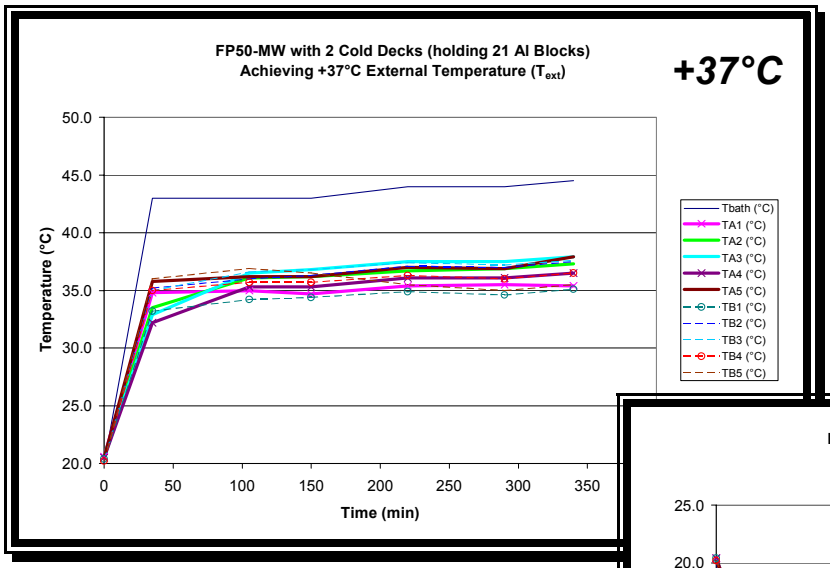

Figure 2: A Plot of the Test Results for T_{ext}=+37°C.

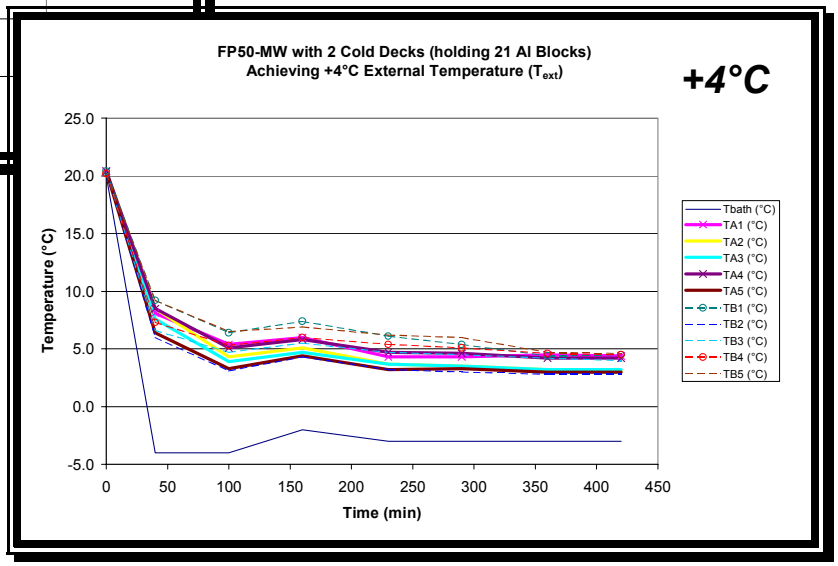

Figure 3: A Plot of the Test Results for Text=+4°C.

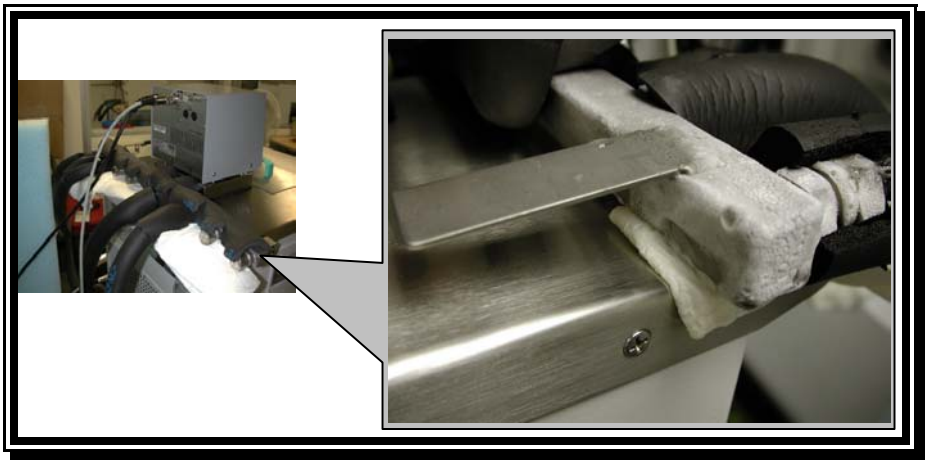

Figure 4: Left image shows Quad-Flow Manifold without proper insulation. Right image demonstrates a "frosted" manifold & tubing, causing loss of cooling capacity.