INTISARI

Alat praktikum pengukuran *head loss mayor* dirancang dan digunakan sebagai media pembelajaran untuk mendukung mata kuliah mekanika fluida. Pentingnya pengetahuan mengenai *head loss mayor* sebagai media pembelajaran menjadikan alat ini harus diadakan. Di prodi teknik mesin Universitas Muhammadiyah Yogyakarta sudah ada alat ukur *head loss mayor* dengan pipa besi, tetapi pada sistem *plumbing* biasanya memakai pipa PVC, dengan demikian lebih baik apabila permodelan alat ukur *head loss mayor* menggunakan pipa PVC.

Metode perancangan alat ukur *head loss mayor* ini melalui tahapan-tahapan penetapan kebutuhan perancangan dengan menghitung diameter pipa, kapasitas pompa, rotameter, dan manometer. Dengan menyesuaikan ukuran diameter pipa dan angka *Reynolds* maksimal maka debit aliran maksimal akan didapatkan. Kemudian data debit aliran maksimal digunakan untuk menghitung kecepatan aliran maksimal. Penetapan pompa dimulai dari perhitungan *head static, head* tekanan, dan *head loss,* setelah semua *head* dihitung maka *head* total pompa didapatkan. Nilai debit aliran maksimal dan *head* pompa dapat digunakan sebagai parameter penentuan pomp, dan dengan data debit aliran masimal maka rotameter dapat ditetapkan. Penentuan manometer didapatkan dari data angka kekasaran pipa, diameter pipa, dan angka *Reynolds* maksimal maka nilai koefisien gesek dapatkan dari diagram Moody untuk data awal menghitung *head loss mayor* yang dibutuhkan untuk mencari perbedaan ketinggian maka manometer yang dapat digunakan dapat ditetapkan. Setelah semua koponen perancangan dihitung langkah selanjutnya adalah desain dan pembuatan alat.

Hasil perancangan menghasilkan bahwa pompa yang dibutuhkan adalah pompa berkapasitas 25 LPM, kemudian angka *Reynolds* $1174<Re<293556$, dan hasil pengujian didapatkan nilai rata-rata koefisien gesek untuk aliran laminar 0,054, aliran transisi 0,054, dan aliran turbulen 0,0345. Deviasi dari alat ukur *head loss* ini untuk nilai koefisien gesek pada aliran laminar adalah 27,48%, transisi 22,04%, turbulen 22,39%. Pengujian membuktikan bahwa tingkat akurasi paling tinggi adalah pada aliran transisi, sedangkan akurasi terendah terdapat pada aliran laminar.

Kata Kunci : Perancangan, *Head losses mayor,* fluida cair

ABSTRACT

The measurement practice tool of head loss mayor was designed and used as learning media to support the subject of fluid mechanics. The importance of the knowledge about head loss mayor as learning media made this tool have to be created. In Mechanical Engineering Study Program of Universitas Muhammadiyah Yogyakarta, there has already been head loss mayor measurement tool with iron pipe, but usually in plumbing system it should use PVC pipe. Thus, it was better if the modelling of the head loss mayor measurement tool used PVC pipe.

The designing method of the head loss mayor measurement tool was through determination stages of the need of the design by measuring the pipe diameter, pump capacity, rotameter, and manometer. By adjusting the measure of the pipe diameter and maximum Reynolds number, the maximum flow debit would be obtained. Then, the data of the maximum flow debit were used to count the maximum flow speed. The pump determination was started from the calculation of head static, head pressure, and head loss. After all the heads were calculated, then the total head would be obtained. The value of the maximum flow debit and the total head, the pump could be used as a parameter of pump determination, and by the data of the maximum flow debit, rotameter could be determined. The manometer determination could be obtained from the data of the pipe roughness number, the pipe diameter, and maximum Reynolds number. Thus, the value of friction coefficient could be obtained from Moody diagram as a starting data to calculate the head loss mayor needed to find the difference of height, and the manometer used could be determined. After all the designing components were calculated, the next step was the design and making of the tool.

The result of the designing showed that the pump needed was a pump with capacity of more than 25 LPM and the Reynolds number of $1174 < Re < 293556$. Then, the result of the test obtained the average value of the friction coefficient for laminar flow of 0.054, the transition flow of 0.054, and the turbulence flow of 0.0345. The deviation of the measurement tool of head loss for the friction coefficient value in the laminar flow was 27.48%, the transition was 22.04%, and turbulence was 22.39%. The test proved that the highest accuracy level was in the transition flow, while the lowest accuracy was in the laminar flow.

Keywords: Designing, Head Loss Mayor, Liquid Fluid