



# FillFactor Setting Document

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# 1. Introduction

The FILLFACTOR feature optimizes the utilization of space for data pages by reserving space for the expansion of existing records. The main benefit of setting fillfactor is to avoid *indirect records* caused by the expansion of existing records due to update statements. When a record grows up and the page free space is not enough, this record becomes an indirect record. The indirect record needs more I/O and may cause performance down, so we had better to reduce the occurrence of the indirect record.

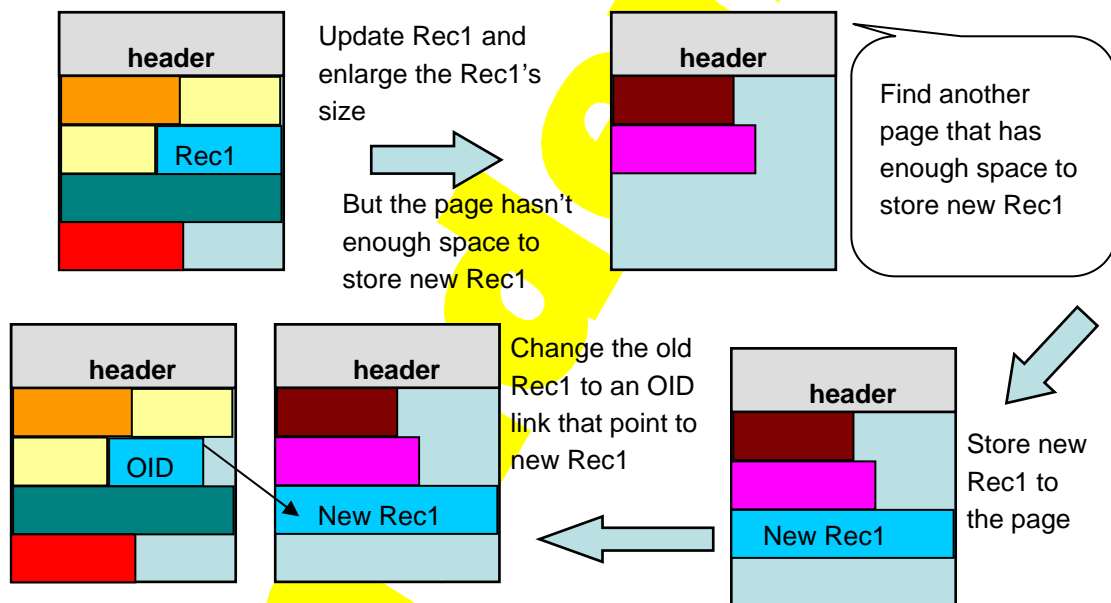


Figure 1 . Example of indirect record

Fillfactor specifies the percentage of a page as the high watermark that can be filled before stopping new records from being inserted. Using this method records can be accessed more efficiently by avoiding the need to retrieve information for one record from multiple pages. However, setting it too small may also cause unnecessary page accesses. The valid range is 50 to 100.

When the page's utilization rate reaches the fillfactor, the page would be marked with "FULL" and DBMaster cannot insert any new record into it. After DBMaster delete any record from the page and the page's utilization rate is lower than 50%, the page's "FULL" mark will be removed. Takes the below figure as example :

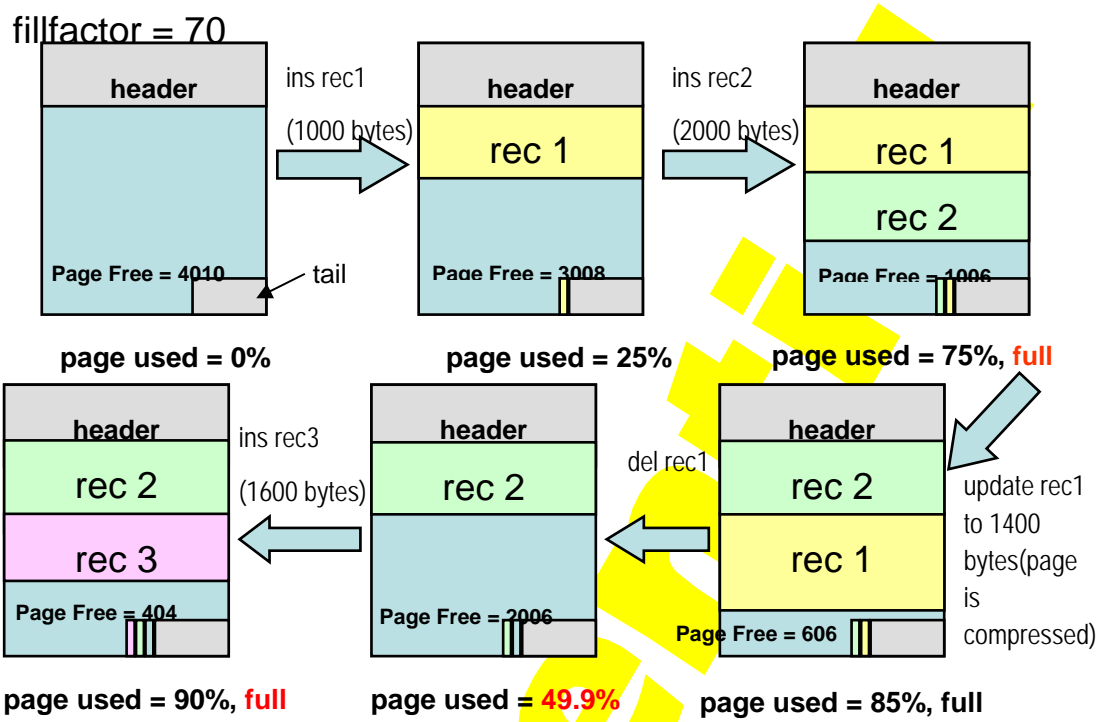


Figure 2 . Example of fillfactor

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## 2. Deciding Fillfactor

Depending on the different case to use the appropriate fillfactor, here are some rules of thumb.

If a table fits one of the following criteria, set a larger fillfactor for it:

1. The table rarely updates.
2. The record size is mostly fixed, ie. all columns are mostly fixed-length and not null. The fillfactor of a table with fixed-size records can be set to 100.
3. Neither of above, but the frequently updated columns are largely fixed-length.

Here are the steps to estimate the lower bound:

1. Calculate the record size *Empty* with all nullable columns null and variable-length columns empty.
2. Calculate the record size *Full* with all columns filled and in full length.
3. Then the fillfactor should not be smaller than  **$\max(50, \text{Empty}/\text{Full} * 100)$**

For most cases the ideal fillfactor will fall in between this value and 100, and you should be able to narrow down the range by calculating *Empty* depending on the real case. For example:

```
table1 {  
  c1 int not null;  
  c2 int;  
  c3 char(20) not null;  
  c4 varchar(12) not null;  
}
```

In this case,  $\text{Empty} = 4 + 0 + 20 + 0 = 24$ ,  $\text{Full} = 4 + 4 + 20 + 12 = 40$ , so the fillfactor should be at least  $24/40 * 100 = 60$ .

However, if c4 is restricted by AP to at least six characters (for instance, password), *Empty* should be  $4 + 0 + 20 + 6 = 30$ , and the fillfactor be not smaller than  $30/40 * 100 = 75$ .

For BLOB/CLOB columns, use 8 bytes (size of OID) as their size.

Please note that the calculation of actual usage of pages could become very complicated. The method provided here is to give a quick and effective way to estimate a range.