

# The Yeast in the Brewery

**Management – Pure yeast cultures – Propagation**

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# Preface

The brewing yeast *Saccharomyces cerevisiae* var. is the most important microorganism for the production of beer. Beside the raw materials malt, hops and water the properties of the yeast influence in a decisive way the quality of the end product beer and the productivity of the fermentation and maturation processes in the brewery.

The yeast management's task is in the first place to provide the brewer with pitching yeast in the required amount and quality and at the right time; further to choose and to take the best care of the yeast strain best suited for any particular brewery, to reproduce it, to design and run the yeast propagation plant and finally to best utilize the surplus yeast and treat the recovered beer extracted from it.

Due to the introduction of large cylindroconical tanks (CCV) for primary fermentation and maturation, the beer quality requirements have grown, particularly in regard to its shelf life and its stability: hence also the purity of the pitching yeast and the reliability of the yeast propagation plants had to be increased.

The purpose of this book is to provide information on the following topics:

- Yeast – systematic;
- The history of the development of pure yeast culture techniques;
- Requirements on the pitching yeast and need to regenerate the inoculum;
- Chemical composition of the yeast;
- Physical properties of the yeast (density, cell size, rheological parameters, osmotic pressure, surface charge);
- Structure and functions of the yeast cell;
- Yeast multiplication and its kinetics;
- Metabolic reactions and regulatory mechanisms;
- Nutritional requirements of the yeast;
- Oxygen requirements of the yeast;
- Equipment for yeast multiplication;
- Suggestions for the design of propagation plants;
- Yeast management in the brewery;
- Recovery of beer from surplus yeast.

The authors have endeavoured to put fundamental scientific knowledge in the centre of their considerations, in order to avoid the danger of dealing with their subject too subjectively: it is in fact their goal to offer objective information about yeast management and yeast multiplication, so contributing to a realistic evaluation of the different phases and possible steps.

The following exposition is not intended to substitute for what can be found in the technical literature on the subject "yeast". Beside the quoted publications the authors refer in particular to the book "The Yeasts" [127], which they consider a reference standard.

They are further indebted to several companies for kindly supplying documentation and to the following persons for valuable support during experimental work: *Udo Kriegel*

(GEA GmbH), Mrs. *Margret Lamers* and Dr. *Juliane Kunte* (Berliner-Kindl-Schultheiss-Brauerei GmbH).

Thanks are due also to Dr. *Peter Lietz*, who has written Chapter 2, containing some historical data about the cultivation of pure yeasts.

For a detailed description of the development of beer fermentation and ripening processes, as well as the formation and influencing of the fermentation by-products, see the literature [1]. The influence of the yeast on the clarification and filterability of the beers is described in [2]. The microbiological operational control is not covered by this publication (see also [222]).

In this context, we would like to express our special thanks to Dr. *Tullio Zangrando* from Pedavena, Italy, who with great enthusiasm translated the entire text of the 1st German edition into English.

In addition, we would like to thank *Kurt Marshall* and *Olaf Hendel* – both with VLB Berlin – for their intensive revision of the translation.

## **Preface to the 2<sup>nd</sup> English Edition**

The positive feedback to the German edition of “Yeast in the Brewery”, which has been meanwhile published in the 2<sup>nd</sup> and 3<sup>rd</sup> edition, has encouraged us to additionally present this book to international experts as 2nd revised English edition.

Even if the subject of yeast in the brewery is discussed primarily from the viewpoint of the German purity law (Reinheitsgebot), we are sure that this book will be a valuable source of information for the international brewers’ community.

The presented 2<sup>nd</sup> English edition has been updated and corrections have been made, along with the addition of supplemental information in several chapters.

The authors like to thank *Christopher Bergthold*, Berlin, for the translation of the updated sections and the revision of the whole script.

Berlin, January 2018

*Gerolf Annemüller and Hans-J. Manger*